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NEW CHAPTERS IN THE WARFARE OF SCIENCE.

X. THE FALL OF MAN AND ANTHROPOLOGY.

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PART I.

IN the previous chapters we have seen how science, especially within the past few years, has thoroughly changed the intelligent thought of the world in regard to the antiquity of man upon our planet; and how the fabric built upon the chronological indications in our sacred books, first, by the early fathers of the Church, afterward by the mediæval doctors, and finally by the reformers and modern orthodox chronologists, has virtually disappeared before an entirely different view forced upon us, especially by Egyptian studies, Geology, and Archæology.

In this chapter I purpose to present some outlines of the work of Anthropology, especially as assisted by Ethnology, in showing what the evolution of human civilization has been.

Here, too, the change from the old theological view based upon the letter of our sacred books to the modern scientific view based upon evidence absolutely irrefragable, is complete. Here, too, we are at the beginning of a vast change in the basis and modes of thought upon man—a change far more striking than that accomplished by Copernicus and Galileo when they substituted for a universe in which sun and planets revolved about the earth, a universe in which the earth is but the merest grain or atom revolving with other worlds, larger and smaller, about the sun; and all these forming but one among innumerable systems.

Ever since the beginning of man's effective thinking upon the great problems around him, two views have existed regarding the life of the human race upon earth, each utterly opposed to the other. The first of these is the belief that man was created "in the beginning," a perfect being, endowed with the highest moral

and intellectual powers, but that there came a "fall," as the result of which came into the world evil, toil, sorrow, and death.

Nothing could be more natural than such an explanation of the existence of evil, in times when men saw everywhere miracle and nowhere law. It is, under such circumstances, by far the more easy explanation, for it is in accordance with the appearances of things: men adopted it just as naturally as they adopted the theory that the Almighty hangs up the stars as lights in the solid firmament above the earth, or trundles the sun behind a high mountain at night, or wheels the planets around the earth, or flings comets as "signs and wonders" to scare a wicked world, or allows evil spirits to control thunder, lightning, and storm, and to cause diseases of body and mind, or that he opens the "windows of heaven" to let down "the waters that be above the heavens," and thus to give rain upon the earth.

A belief, then, in a primeval period of innocence, physical perfection, and intellectual strength, from which men for some fault fell, is perfectly in accordance with what we should expect.

Among the earliest known records of our race we find this view taking shape in the Chaldean legends of war between the gods, and a fall of man; both of which seemed necessary to explain the existence of evil.

In Greek mythology perhaps the best-known statement was made by Hesiod: to him it was revealed, regarding the men of the most ancient times, that they were, at first, "a golden race," that "as gods they were wont to live, with a life void of care, without labor and trouble; nor was wretched old age at all impending, but ever did they delight themselves out of the reach of all ills, and they died as if overcome by sleep; all blessings were theirs; of its own will the fruitful field would bear them fruit, much and ample, and they gladly used to reap the labors of their hands in quietness along with many good things, being rich in flocks and true to the blessed gods." But there came a "fall" caused by human curiosity. Pandora, the first woman created, received a vase which, by divine command, was to remain closed; but she was tempted to open it, and troubles, sorrow, and sickness in every form escaped into the world, hope alone remaining.

So, too, in Roman mythological poetry, the well-known picture by Ovid is but one among the many exhibitions of this same belief in a primeval golden age—a Saturnian cycle—one of the constantly recurring attempts, so universal and so natural in the early history of man, to account for the existence of evil, care, and toil on earth by explanatory myths and legends.

This view we also find embodied in the sacred tradition of the Jews, and especially in one of the documents which form the impressive poem beginning the books attributed to Moses. As to the

Christian Church, no word of its Blessed Founder indicates that it was committed by Him to this theory, or that He even thought it worthy of his attention: how it was developed it does not lie within the province of this chapter to point out; nor is it worth our while to dwell upon its evolution in the early Church, in the middle ages, at the Reformation, and in various branches of the Protestant Church; suffice it that, though among English-speaking nations, by far the most important influence in its favor has come from Milton's inspiration rather than from that of older sacred books, no doctrine has been more universally accepted, "always, everywhere, and by all," from the earliest fathers of the Church down to the present hour.

On the other hand, appeared at an early period the opposite view—that mankind, instead of having fallen from a high intellectual, moral, and religious condition, has slowly risen from low and brutal beginnings. Among all the statements of this theory one is especially noteworthy; that given by Lucretius in his great poem on The Nature of Things. Despite its errors, it remains among the most remarkable examples of prophetic insight in the history of our race. The inspiration of Lucretius gave him almost miraculous glimpses of truth; his view of the development of civilization from the rudest beginnings to the height of its achievements is a wonderful growth, rooted in observation and thought, branching forth into a multitude of striking facts and fancies; and among these is the statement regarding the sequence of inventions:

> "Man's earliest arms were fingers, teeth, and nails,
> And stones and fragments from the branching woods:
> Then copper next; and last, as latest traced,
> The tyrant, iron."

Thus did the poet prophesy one of the most fruitful achievements of modern science, the discovery of that series of epochs which has been so carefully studied in our century.

Very striking, also, is the statement of Horace, though his idea is evidently derived from Lucretius. He dwells upon man's first condition on earth as low and bestial, and pictures him lurking in caves, progressing from the use of his fists and nails, first to clubs, then to arms which he had learned to forge, and, finally, to the invention of the names of things, to literature, and to laws.*

During the mediæval ages of faith this view was almost entirely obscured, but at the revival of learning in the fifteenth century it reappeared; and in the first part of the seventeenth

* For the passage in Hesiod, as given, see the Works and Days, lines 109–120, in Banks's translation. As to Horace, see the Satires, I, 3, 99. As to the relation of the poetic account of the Fall in Genesis to Chaldean myths, see Smith, Chaldean Account of Genesis, pp. 13, 17. For a very instructive separation of the Jehovistic and Elohistic parts

century we find that among the crimes for which Vanini was sentenced at Toulouse to have his tongue torn out and to be burned alive was his belief that there is a gradation extending upward from the lowest to the highest form of created beings.

In the eighteenth century we find this same idea of an upward progress, especially through the three ages of stone, bronze, and iron, cropping out in scientific form still more definitely from beneath the vast mass of theological reasoning in Germany, France, and England.

The investigations of the last forty years have shown that Lucretius and Horace were inspired prophets: what they saw by the exercise of reason illumined by poetic genius has been now thoroughly based upon facts carefully ascertained and arranged; until Thomsen and Nilsson, the northern archæologists, have brought these prophecies to evident fulfillment, by presenting a scientific classification dividing the age of prehistoric man in various parts of the world between an old stone period, a new stone period, a period of beaten copper, a period of bronze, and a period of iron; and arraying vast masses of facts from all parts of the world, fitting thoroughly into each other, strengthening each other, and showing beyond a doubt that, instead of a *fall*, there has been a *rise* of man from the earliest indications in the Quaternary or even, possibly, in the Tertiary period.*

The first blow at the fully developed doctrine of "the fall" came, as we have seen, from geology. According to that doctrine, as held quite generally from its beginnings among the fathers and doctors of the primitive Church down to its culmination in

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of Genesis, with the account of the "Fall" as given in the former, see Lenormant, La Génèse, Paris, 1883, pp. 166–168. Of the lines of Lucretius—

> "Arma antiqua, manus, ungues, dentesque fuerunt,
> Et lapides, et item sylvarum fragmina rami,
> Posterius ferri vis est, aerisque reperta,
> Sed prior aeris erat, quam ferri cognitus usus"—

the translation given is that of Good. For a more exact prose translation, see Munro's Lucretius, fourth edition, which is much more careful, at least in the proof-reading, than the first edition. As regards Lucretius's prophetic insight into some of the greatest conclusions of modern science, see Munro's Translation and Notes, fourth edition, Book V, Notes II, p. 335. On the relation of several passages in Horace to the ideas of Lucretius, see Munro as above.

* For Vanini, see Topinard, Éléments d'Anthropologie, p. 52. For a brief and careful summary of the agency of Eccard in Germany, Goguet in France, Hoare in England, and others in various parts of Europe, as regards this development of the scientific view during the eighteenth century, see Mortillet, Le Préhistorique, Paris, 1885, chap. i. And for a shorter summary see Lubbock, Prehistoric Man. For the statements by the northern archæologists, see Nilsson, Worsaae, and the other main works cited in this article. For a generous statement regarding the great services of the Danish archæologists in this field, see Quatrefages, Introduction to Cartailhac, Les Ages Préhistoriques de l'Espagne et du Portugal.

the minds of great Protestants like John Wesley, the statement in our sacred books that "death entered the world by sin" was taken as a historic fact, necessitating the conclusion that, before the serpent persuaded Eve to eat of the forbidden fruit, death on our planet was unknown. Naturally, when geology revealed in the strata of a period long before the coming of man on earth, a vast multitude of carnivorous tribes fitted to destroy their fellow-creatures on land and sea, and within the fossilized skeletons of many of these the partially digested remains of animals, this doctrine was too heavy to be carried, and it was quietly dropped.

But about the middle of the nineteenth century the doctrine of the rise of man as opposed to the doctrine of his "fall" received a great accession of strength from a source most unexpected. As we saw in the last chapter, the facts proving the great antiquity of man foreshadowed a new and even more remarkable idea regarding him. We saw, it is true, that the opponents of Boucher de Perthes, while they could not deny his discovery of human implements in the drift, were successful in securing a verdict of "not proven" as regarded his discovery of human bones; but their triumph was short-lived. Many previous discoveries, little thought of up to that time, began to be studied, and others were added which resulted, not merely in confirming the truth regarding the antiquity of man, but in establishing another doctrine which the opponents of science regarded with vastly greater dislike—the doctrine that man has not fallen from an original high estate in which he was created about six thousand years ago; but that, from a period vastly earlier than any warranted by the sacred chronologists, he has been—in spite of lapses and deteriorations here and there—rising.

A brief review of this new growth of truth may be useful. As early as 1835 Prof. Jaeger had brought out from a quantity of Quaternary remains, dug up long before at Cannstadt, near Stuttgart, a portion of a human skull, apparently of very low type. A battle raged about it for a time, but this finally subsided, owing to uncertainties arising from the circumstances of the discovery.

In 1856, in the Neanderthal, near Düsseldorf, among Quaternary remains gathered on the floor of a grotto, another skull was found bearing the same evidence of a low human type. As in the case of the Cannstadt skull, this again was fiercely debated, and finally the questions regarding it were allowed to remain in suspense. But new discoveries were made: at Eguisheim, at Brux, at Spy, and elsewhere human skulls were found of a similarly low type; and while each of the earlier discoveries was open to debate, and either, had no other been discovered, might have been considerd an abnormal specimen, the combination of all these showed conclusively that not only had a race of men existed at that remote

period, but that it was of a type as low as the lowest, perhaps below the lowest, now known.

Research was now redoubled, and, as a result, human skulls and complete skeletons of various types began to be discovered in the ancient deposits of many other parts of the world, and especially in France, Belgium, Germany, the Caucasus, Africa, and North and South America.

But soon began to emerge from all these discoveries a fact of enormous importance: The skulls and bones found at Cro Magnon, Solutré, Furfooz, Grenelle, and elsewhere, were compared, and it was thus made certain that various races had already appeared and lived in various grades of civilization, even in those enormously remote epochs; that even then there were various strata of humanity ranging from races of a very low to those of a very high type; and that upon any theory, certainly upon the theory of the origin of mankind from a single pair, two things were evident: first, that long, slow processes during vast periods of time, must have been required for the differentiation of these races, and for the evolution of man up to the point where the better specimens show him, certainly in the early Quaternary and perhaps in the Tertiary period; and, secondly, that there had been from the first appearance of man, of which we have any traces, an *upward* tendency.*

This second conclusion—the upward tendency of man from low beginnings—was made more and more clear by bringing into relations with these remains of human bodies and of extinct animals the remains of human handiwork. As stated in the last chapter, the river-drift and bone-caves in Great Britain, France, and other parts of the world, revealed a progression, even in the various divisions of the earliest Stone period; for, beginning at the very earliest strata of these remains, on the floors of the caverns, associated mainly with the bones of extinct animals, the cave bear, the hairy elephant, and the like, were the rudest implements;

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* For Wesley's statement of the amazing consequences of the entrance of death into the world by sin, see citations from his sermon on The Fall of Man in my chapter on Geology. For Boucher de Perthes, see his Life by Ledieu, especially chapters v and xix; also letters in the appendix; also Les Antiquités Celtiques et Antediluviennes, as cited in previous chapters of this series. For an account of the Neanderthal man and other remains mentioned, see Quatrefages, Human Species, chap. xxvi; also Mortillet, Le Préhistorique, Paris, 1885, pp. 232 *et seq.*, also other writers cited in this chapter. For the other discoveries mentioned, see the same sources. For an engraving of the skull and the restored human face of the Neanderthal man, see Reinach, Antiquités Nationales, etc., vol. i, p. 138. For the vast regions over which that early race spread, see Quatrefages as above, p. 307. See also the same author, Histoire Générale des Races Humaines, in the Bibliothèque Ethnologique, Paris, 1887, p. 4. In the vast mass of literature bearing on this subject, see Quatrefages, Dupont, Reinach, Joly, Mortillet, Tylor, and Lubbock, in works cited through these chapters.

then, in strata above these, sealed in the stalagmite of the cavern floors, lying with the bones of extinct animals, some of them more recent, stone implements were found, still rude, but, as a rule, of an improved type; and, finally, in a still higher stratum, associated with bones of animals like the reindeer and bison, which, though not extinct, have departed to other climates, were rude stone implements, on the whole of a still better workmanship. Such was the foreshadowing, even at that early rude Stone period, of the proofs that the tendency of man has been from his earliest epoch and in all parts of the world, as a rule, upward.

But this rule was to be much further exemplified. About 1850, while the French and English geologists were working more especially among the relics of the drift and cave periods, noted archæologists of the North, Forchammer, Steenstrup, and Worsaae, were devoting themselves to the investigation of certain remains upon the Danish Peninsula. These remains were of two kinds: first, there were vast shell-heaps or accumulations of shells and other refuse cast aside by rude tribes which, at some unknown age in the past, lived on the shores of the Baltic, principally on shell-fish. That these shell-heaps were very ancient was evident; the shells of oysters and the like found in them were far larger than any now found on those coasts; their size, so far from being like that of the corresponding varieties which now exist in the brackish waters of the Baltic, was in every case like that of those varieties which only thrive in the waters of the open salt sea: here was a clear indication that at the time when man formed these shell-heaps those coasts were in far more direct communication with the salt sea than at present, and that sufficient time must have elapsed since that period to have wrought enormous changes in sea and land throughout those regions.

Scattered through these heaps were found indications of a grade of civilization when man still used implements of stone, but implements and weapons, which, though still rude, showed a progress from those of the drift and early cave period; some of them, indeed, being of polished stone.

With these were other evidences that civilization had progressed. With implements rude enough to have survived from early periods, other implements never known in the drift and bone caves began to appear, and though there were few if any bones of other domestic animals, the remains of dogs were found; everything showed that there had been a progress in civilization between the former and this Stone epoch.

The second series of discoveries in Scandinavia was made in the peat-beds; these were generally formed in hollows or bowls varying in depth from ten to thirty feet, and a section of them, like a section of the deposits in the bone caverns, showed a grad-

ual evolution of human culture. The lower strata in these great bowls were found to be made up chiefly of mosses and various plants matted together with the trunks of fallen trees, sometimes of very large diameter; and the botanical examination of the lowest layer of these trees and plants in the various bowls revealed a most important fact: for this layer, the first in point of time, was always of the Scotch fir—which now grows nowhere in the Danish islands, and can not be made to grow anywhere in them—and of plants which are now extinct in these regions, but have retreated within the Arctic Circle. Coming up from the bottom of these great bowls there was found above the first layer a second, in which were matted together masses of oak-trees of different varieties; these, too, were relics of a bygone epoch, since the oak has almost entirely disappeared from Denmark. Above these came a third stratum made up of fallen beech-trees, and the beech is now the most common tree of the Danish Peninsula.

And now came a second fact of the utmost importance as connected with the first: scattered, as a rule, through the lower of these deposits, that of the extinct fir-trees and plants, were found implements and weapons of smooth stone; in the layer of oak-trees were found implements of bronze; and among the layer of beeches were found implements and weapons of iron.

The general result of these investigations in these two sources, the shell mounds and the peat deposits, was the same: the first civilization evidenced in them was marked by the use of stone implements more or less smooth, showing a progress from the earlier rude Stone period made known by the bone caves; then came a later progress to a higher civilization, marked by the use of bronze implements; and, finally, a still higher development when iron began to be used.

The labors of the Danish archæologists have resulted in the formation of a great museum at Copenhagen, and on the specimens they have found, coupled with those of the drift and bone caves, is based the classification between the main periods or divisions in the evolution of the human race above referred to.

It was not merely in Scandinavian lands that these results were reached; substantially the same discoveries were made in Ireland and France, in Sardinia and Portugal, in Japan and in Brazil, in Cuba and in this country; in fact, as a rule, in nearly every part of the world which was thoroughly examined.*

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* For the general subject, see Mortillet, Le Préhistorique, p. 498, *et passim*. For examples of the rude stone implements, improving as we go from earlier to later layers in the bone caves, see Boyd Dawkins, Early Man in Britain, chap. vii, p. 186; also Quatrefages, Human Species, New York, 1879, pp. 305 *et seq*. An interesting gleam of light is thrown on the subject in De Baye, Grottes Préhistoriques de la Marne, pp. 31 *et seq*.; also Evans, as cited in the previous chapter. For the more recent investigations in the Danish shell-heaps, see

But from another quarter came a yet more striking indication of this same evolution. As far back as the year 1829 there were discovered, in the Lake of Zurich, piles and other antiquities indicating a former existence of human dwellings, standing in the water at some distance from the shore; but the usual mixture of thoughtlessness and dread of new ideas seems to have prevailed, and nothing was done until about 1853, when new discoveries of the same kind were followed up vigorously, and such men as Rütimeyer, Keller, and Troyon showed not only in the Lake of Zurich, but in many other lakes in Switzerland, remains of former habitations, and, in the midst of these, great numbers of relics, exhibiting the grade of civilization which those lake-dwellers had attained.

Here, too, were accumulated proofs of the upward tendency of the human race. Implements of polished stone, bone, leather, pottery of various grades, woven cloth, bones of several kinds of domestic animals, various sorts of grain, bread which had been preserved by charring, and a multitude of evidences of progress never found among the earlier, ruder relics of civilization, showed yet more strongly that man had arrived here at yet a higher stage than his predecessor of the drift, cave, and shell-heap periods, and had gone on from better to better.

Very striking evidences of this upward tendency were found in each class of implements: as by comparing the chipped flint implements of the lower and earlier strata in the cave period with those of the latter and upper strata we saw progress, so, in each of the periods of polished stone, bronze, and iron, we see a steady progress from rude to perfected implements; especially is this true in the remains of the various lake-dwellings, for among these can be traced out constant improvements in means of subsistence and in ways of living.

Incidentally, too, a fact—at first sight of small account, but on reflection exceedingly important—was revealed. The earlier bronze implements were frequently found to imitate in various minor respects implements of stone; in other words, forms were at first given to bronze implements natural in working stone, but not natural in working bronze. This showed the *direction* of the development—that it was upward from stone to bronze, not down-

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Boyd Dawkins, Early Man in Britain, pp. 303, 304. For these evidences of advanced civilization in the shell-heaps, see Mortillet, p. 498. He, like Nilsson, says, that only the bones of the dog were found; but compare Dawkins, p. 305. For the very full list of these discoveries, with their bearing on each other, see Mortillet, p. 499. As to those in Scandinavian countries, see Nilsson, The Primitive Inhabitants of Scandinavia, third edition, with Introduction by Lubbock, London, 1868; also the Pre-History of the North, by Worsaae, English translation, London, 1886. For shell-mounds and their contents in the Spanish Peninsula, see Cartailhac's greater work already cited. For summary of such discoveries throughout the world, see Mortillet, Le Préhistorique, pp. 497 *et seq.*

ward from bronze to stone; that it was progress rather than decline.

These investigations were supplemented by similar researches elsewhere. In many other parts of the world it was found that lake-dwellers had existed in different grades of civilization, but all within a certain range, intermediate between the cave-dwellers and the historic period. To explain this epoch of the lake-dwellers history came in with the account given by Herodotus of the lake-dwellings on Lake Prasias, which gave protection from the armies of Persia. Still more important, Comparative Ethnography showed that to-day, in various parts of the world, especially in New Guinea and West Africa, races of men are living in lake-dwellings built upon piles, and with a range of implements and weapons strikingly like many of those discovered in these ancient lake deposits of Switzerland.

In Great Britain, France, Germany, Italy, Ireland, Scotland, and other countries, remains of a different sort were also found, throwing light on this progress. The cromlechs, cranogs, mounds, and the like, though some of them indicate the work of weaker tribes pressed upon by stronger, show, as a rule, the same upward tendency.

At a very early period in the history of these discoveries, various attempts were made, in the supposed interest of Scripture, to break the force of such evidences of the progress and development of the human race from lower to higher. Out of all the earlier efforts two may be taken as fairly typical, for they exhibit the opposition as developed under two different schools of theology, each working in its own way. The first of these shows great ingenuity and learning, and is presented by Mr. Southall, in his book, published in 1875, entitled The Recent Origin of the World. In this he grapples first of all with the difficulties presented by the early date of Egyptian civilization, and the keynote of his argument is the statement made by an eminent Egyptologist, at a period before modern archæological discoveries were well understood, that "Egypt laughs the idea of a rude stone age, a polished stone age, a bronze age, an iron age, to scorn."

Mr. Southall's method was substantially that of the late excellent Mr. Gosse in geology. Mr. Gosse, as the readers of these chapters may remember, felt obliged, in the supposed interest of Genesis, to insist that the only safety was in believing that, six thousand years ago, the Almighty, for some inscrutable purpose, in a moment, set Niagara pouring very near the spot where it is pouring now; laid the various strata, and sprinkled the fossils through them like plums through a pudding; scratched the glacial grooves upon the rocks, and did the vast multitude of things, little and great, in all parts of the world, required to delude geologists

of modern times into the conviction that all these things were the result of a steady progress through long epochs. On a similar plan, Mr. Southall proposed, at the very beginning of his book, as a final solution of the problem, the declaration that Egypt, with its high civilization in the time of Mena, with its races, classes, institutions, arrangements, language, monuments—all indicating an evolution through a vast previous history—was a sudden creation which came fully made from the hands of the Creator. To use his own words, "The Egyptians had no stone age, and were born civilized."

There is an old story that once on a time a certain jovial King of France, making a progress through his kingdom, was received at the gates of a provincial town by the mayor's deputy, who began his speech on this wise: "May it please your Majesty, there are just thirteen reasons why his honor the mayor can not be present to welcome you this morning. The first of these reasons is that he is dead." On this the king graciously declared that this first reason was sufficient, and that he would not trouble the mayor's deputy for the twelve others.

So with Mr. Southall's argument: one simple result of scientific research out of many is all that it is needful to state, and this is, that in these later years we have a new and convincing evidence of the existence of prehistoric man in Egypt in his earliest, rudest beginnings—the very same evidence which we find in all other parts of the world which have been carefully examined. This evidence consists of stone implements which have been found in Egypt in such forms, at such points, and in such positions that when studied in connection with those found in all other parts of the world, from New Jersey to California, from France to India, and from England to the Andaman Islands, they force upon us the conviction that civilization in Egypt, as in all other parts of the world, was developed by the same slow process of evolution from the rudest beginnings.

It is true that men learned in Egyptology had discouraged the idea of an earlier stone age in Egypt, and that among these were Lepsius and Brugsch; but these men were not trained in prehistoric archæology; their devotion to the study of the monuments of Egyptian civilization had evidently drawn them away from sympathy, and indeed from acquaintance with the work of men like Boucher de Perthes, Lartet, Nilsson, Troyon, and Dawkins. But a new era was beginning: in 1867 Worsaae called attention to the prehistoric implements found on the borders of Egypt; two years later Arcelin discussed such stone implements found beneath the soil of Sakkara and Ghizeh, the very focus of the earliest Egyptian civilization; in the same year Hamy and Lenormant found such implements washed out from

the depths higher up the Nile at Thebes, near the tombs of the kings; and in the following year they exhibited more flint implements found at various other places. Coupled with these discoveries was the fact that Horner and Linant found a copper knife at twenty-four feet and pottery at sixty feet below the surface. In 1872 Dr. Reil, director of the baths at Helouan, near Cairo, discovered implements of chipped flint; and in 1877 Dr. Jukes Brown made similar discoveries in that region. In 1878 Oscar Fraas, summing up the question, showed that the stone implements were mainly such as are found in the prehistoric deposits of other countries, and that Zittel, having found them in the Libyan Desert, far from the oases, there was reason to suppose that these implements were used before the region became a desert and before Egypt was civilized. Two years later Dr. Mook, of Würzburg, published a work giving the results of his investigations with careful drawings of the rude stone implements discovered by him in the upper Nile Valley, and it was evident that, while some of these implements differed slightly from those before known, the great mass of them were of the character so common in the prehistoric deposits of other parts of the world.

A yet more important contribution to this mass of facts was made by Prof. Henry Haynes, of Boston, who in the winter of 1877 and 1878 began a very thorough investigation of the subject, and discovered, a few miles east of Cairo, many flint implements. The significance of Haynes's discoveries was twofold: First, there were, among these, stone axes like those found in the French drift-beds of St. Acheul, showing that the men who made these in Egypt were passing through the same phase of savagery as that of Quaternary France; secondly, he found a workshop for making these implements, proving that these flint implements were not brought into Egypt by invaders, but made to meet the necessities of the country. From this first field Prof. Haynes went to Helouan, north of Cairo, and there found, as Dr. Reil had done, various worked flints, some of them like those discovered by M. Rivière in the caves of southern France; thence he went up the Nile to Luxor, the site of ancient Thebes, began a thorough search in the Tertiary limestone hills, and found multitudes of chipped stone implements, some of them, indeed, of original forms, but most of forms common in other parts of the world under similar circumstances, some of the chipped stone axes corresponding closely to those found in the drift-beds of northern France.

Nothing in its way can be more perfect than the modest monograph in which Prof. Haynes records these researches, and the photographs of these chipped flint implements show conclusively that, long ages before the earliest period of Egyptian civilization of which the monuments of the first dynasties give us any trace,

mankind in the Nile Valley was going through the same slow progress from the period when, standing just above the brutes, he defended himself with implements of rudely chipped stone.

But in 1881 came discoveries which settled the question entirely. In that year General Pitt-Rivers, a Fellow of the Royal Society and President of the Anthropological Institute, and J. F. Campbell, Fellow of the Royal Geographical Society of England, found implements not only in alluvial deposits, associated with the bones of the zebra, hyena, and other animals which have since retreated farther south, but, at Djebel Assas, near Thebes, they found implements of chipped flint in the hard, stratified gravel, from six and a half to ten feet below the surface; relics evidently, as Mr. Campbell says, "beyond calculation older than the oldest Egyptian temples and tombs." They certainly proved that Egyptian civilization had not issued in its completeness, and all at once, from the hand of the Creator in the time of Menes. Thus was ended the contention of Mr. Southall.

Still another attack upon the new scientific conclusions came from France, when in 1883 the Abbé Hamard, Priest of the Oratory, published his Age of Stone and Primitive Man. He had been especially stirred up by the arrangement of prehistoric implements by periods at the Paris Exposition of 1878; he bitterly complains of all these as having an anti-Christian tendency, and rails at science as "the idol of the day." He attacks Mortillet, one of the leaders in French archæology, with a great display of contempt; speaks of the "venom" in books on prehistoric man generally; complains that the Church is too mild and gentle with such monstrous doctrines; bewails the concessions made to science by some eminent preachers, and foretells his own martydom at the hands of men of science.

Efforts like these accomplished little, and a more legitimate attempt was made to resist the conclusions of archæology in Egypt by showing that knives of stone were used in obedience to a sacred ritual in Egypt for embalming and in Judea for circumcision, and that these flint knives might have had this later origin. But the argument against this view was triple: First, as we have seen, not only stone knives, but axes and other implements of stone similar to those of a prehistoric period in western Europe were discovered; secondly, these implements were discovered in the hard gravel drift of a period evidently far earlier than that of Menes; and, thirdly, the use of stone implements in Egyptian and Jewish sacred functions, so far from weakening the force of the arguments for the long and slow development of Egyptian civilization from the men who used rude flint implements to the men who built and adorned the great temples of the early dynasties, is really an argument in favor of that long evolution. A study of

comparative ethnology has made it clear that the sacred stone knives and implements of the Egyptian and Jewish priestly ritual were natural survivals of that previous period. For sacrificial or ritual purposes, the knife of stone was considered more sacred than the knife of bronze or iron, simply because it was ancient; just as to-day in India, Brahman priests kindle the sacred fire, not with matches or flint and steel, but by a process found in the earliest, lowest stages of human culture—by violently boring a pointed stick into another piece of wood until a spark comes; and just as to-day, in Europe and America, the architecture of the middle ages survives as a special religious form in the erection of our most recent churches, and to such an extent that thousands on thousands of us feel that we can not worship fitly unless in the midst of windows, decorations, vessels, implements, vestments, and ornaments, no longer used elsewhere, but which have survived in sundry branches of the Christian Church, and derived a special sanctity from the fact that they are of ancient origin.

Taking, then, the whole mass of testimony together, even though a plausible or very strong argument against single evidences may be made here and there, the force of its combined mass remains, and leaves both the vast antiquity of man and the evolution of civilization from its lowest to its highest forms, as proved by the prehistoric remains of Egypt and so many other countries in all parts of the world, beyond a reasonable doubt.*

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* For Mr. Southall's views, see his Recent Origin of Man, p. 20, and elsewhere. For Mr. Gosse's views, see his Omphalos as cited in the chapter on Geology in this series. For a summary of the work of Arcelin, Hamy, Lenormant, Richard, Lubbock, Mook, and Haynes, see Mortillet, Le Préhistorique, *passim*. As to Zittel's discovery, see Oscar Fraas's Aus dem Orient, Stuttgart, 1878. As to the striking similarities of the stone implements found in Egypt with those found in the drift and bone caves, see Mook's Monograph, Würzburg, 1880, cited in the last chapter of this series, especially Plates IX, XI, XII. For even more striking reproductions of photographs showing this remarkable similarity between Egyptian and European chipped stone remains, see H. W. Haynes, Palæolithic Implements in Upper Egypt, Boston, 1881. See also Evans, Ancient Stone Implements, chap. i, pp. 8, 9, 44, 102, 316, 329. As to stone implements used by priests of Jehovah, priests of Baal, priests of Moloch, and priests of Odin, as religious survivals, see Cartailhac, as above, 6 and 7; also Lartet in De Luynes, Expedition to the Dead Sea; also Nilsson, Primitive Inhabitants of Scandinavia, pp. 96, 97. For the discoveries by Pitt-Rivers, see the Journal of the Anthropological Institute of Great Britain and Ireland for 1881, vol. xi, pp. 382 *et seq.*; and for Campbell's decision regarding them, see ibid., pp. 396, 397. For facts summed up in the words, "It is most probable that Egypt at a remote period passed like many other countries through its stone period," see Hilton Price, F. S. A., F. G. S., paper in the Journal of the Archæological Institute of Great Britain and Ireland for 1884, p. 56. Specimens of palæolithic implements from Egypt—knives, arrow-heads, spear-heads, flakes, and the like, both of peculiar and ordinary forms—may be seen in various museums, but especially in that of Prof. Haynes, of Boston. Some interesting light is also thrown into the subject by the specimens obtained by General Wilson and deposited in the Smithsonian Institution at Washington. For the Abbé Hamard's attack, see his L'Âge de la Pierre et l'Homme Primitif, Paris, 1883—especially his preface.

COMMON SENSE APPLIED TO THE TARIFF QUESTION.

By EDWARD ATKINSON.

II.

"WE are at the parting of the ways." Any one who takes the ground that the main object which should be kept in view in placing taxes upon foreign imports may rightly be an attempt to establish any and every branch of industry, great and small, without regarding the use to which imports are to be put, and without any consideration of the temporary obstruction to other branches of industry which must follow any interference with the natural course of trade, may take his own way; he will have no further interest in this essay. Such men may separate themselves under the guidance of their chosen leaders, for such influence upon the question of taxation as they may be capable of exerting. Their position is a very plain one, and it has been rightly named by its chief exponent, the chairman of the Committee of Ways and Means, the method of "*protection with incidental revenue.*" May it not be held that this method is inconsistent with the public welfare and that it is contrary to the very principle of law which has been established by the Supreme Court of the United States in the case of the Loan Association *vs.* Topeka?

In this case, Justice Miller, on behalf of the court, stated this fundamental principle of law as follows: "To lay with one hand the power of the Government on the property of the citizen, and with the other bestow it on favored individuals to aid private undertakings, and to build up private enterprises, is none the less robbery because it is done under the forms of law and is called taxation. This is not legislation; it is a decree under legislative forms. . . . Beyond a cavil there can be no lawful tax which is not laid for a public purpose."

I think it must be clear to every unprejudiced mind that the theory of Mr. McKinley, of "*protection with incidental revenue,*" is in fact forbidden by this dictum of the Supreme Court. It can only be justified by a legal subterfuge, to wit, that a public purpose or necessity exists which justifies doing away with the revenue duty on sugar, thereby depriving the Government of all revenue from that source, and continuing to tax the people in order to pay a bounty to the sugar-planters. The bounty to sugar-planters must be justified, if justified at all, upon the ground that public necessity requires the production of sugar within the limits of our own country, although sugar can be procured at less cost in exchange for wheat, cotton, and oil. If

not so justified, the tax from which the bounty is to be "bestowed upon private individuals to aid private enterprises becomes none the less robbery because it is done under the forms of law, and is called taxation."

This proposition brings the effect of this theory of protection directly into view; one may well ask why the same method should not be adopted to promote other branches of industry. It is admittedly more important that this country should make its own iron than that it should make its own sugar, and the heavy duties on iron and steel have been justified upon the ground that it is for the public interest to make this country independent of all others in the production of iron. It is now independent, whether we will or no; we are consuming thirty-five to forty per cent of the iron of the world and no other country could possibly supply us. On the plea that this branch of industry should be sustained, the consumers of iron and steel in this country have paid a sum in excess of the price paid by the consumers who have been supplied by Great Britain and Germany, ranging from $50,000,000 to $80,000,000 a year for the last ten years. The excess of price has not been paid over to the workmen by the owners of the mines and works, it has been bestowed upon private individuals to aid private enterprises. One has only to examine the average wages of the workmen in the iron mines and works of this country to be convinced that they are much less than the wages of those who are engaged in the conversion of crude iron and steel into machinery, tools, beams, bars, and other forms for use. If it were proposed to remit all duties upon iron and steel, and to pay a bounty to the producers of these crude metals, equal to the excess of price which we have paid for the last ten years, would not that bring the case directly under the law as laid down by Justice Miller? If under such circumstances it would come directly under the law, why does not the case come indirectly under the law, provided a case could be made up to test the question in court? It might be difficult, as a matter of practice, to bring the case into court, but I am inclined to think that if this policy of protection with incidental revenue were to be forced into effect by the votes of a temporary majority of the Congress of the United States, a way might be found to bring this subject before the Supreme Court and to abate this evil by a decision of the court. That is the way by which many of the abuses of the taxing power have been prevented, but the remedy can be more easily applied through legislation. The present tax upon the import of tin plates is purely a revenue measure, because no one makes such plates in this country. The object of raising this tax to twice the rate now levied is that "a bounty may be bestowed upon private individuals in order to aid them in the private enterprise" of

making tin plates. The income of the tax has been asked for this purpose—it has been granted by the majority of the Committee of Ways and Means for this purpose—it is consistent with the so-called principle of protection with incidental revenue, and not a man who has voted for this measure in the House of Representatives can deny that, under the ruling of the Supreme Court, this method "is not legislation; it is a decree under legislative forms, and is none the less robbery because it is called taxation."

On the other hand, almost all the advocates of the theory of protection according to the principles of its founders—viz., temporary support during the period of the infancy of any art—may now be ready to join with the reasonable advocates of freer trade in coming to an agreement upon a measure which would be consistent with existing conditions, and also consistent with common sense. All admit, as Sir Robert Peel did, that we can not apply the absolute theory of free trade at the present time. But we can lay aside our prejudices; we can treat the whole subject in a judicial way; we can adopt a measure of tariff reform which shall lead in due season to such free trade as may be consistent with the necessity of deriving a revenue from duties upon imports, the subjects of taxation being selected with a view to the least burden upon consumers.

We may now take up the right method of bringing an agreement on method into practice and thereby giving the necessary direction to our legislators, who are all seeking for guidance among their constituents. How can we expect legislators to make good laws if their constituents do not themselves know what kind of laws they want?

When this subject is thus approached in a judicial way, there are two lines of preliminary research and two sets of facts of which full cognizance must be taken:

The home market of this country rests for its development, its stability and its profit, upon the prosperity of the great mass of the consumers of this country who are working people busily occupied for gain in all the arts of life; of whom a vast majority are "working people" even in the narrow sense in which that term is commonly used. The census of occupations of those who are engaged in gainful pursuits is doubtless about as accurate as the enumeration of the population itself. Those who are thus occupied for gain and who do all the work of production and distribution, and who enjoy greater or less abundance in their consumption according to their larger or lesser share of the joint annual product, number one in three of the whole population, disregarding fractions. They are listed under different heads, viz.—four general classes, and a great many sub-classes under each of the general heads. The proportions under the four general classes

have not varied much for several decades. According to the census of 1880, the total number of all who were occupied for gain was 17,400,000 out of 50,000,000. (I will omit fractions in dealing with these figures.) A little over twenty-three per cent, numbering about 4,000,000, were occupied in professional and personal service. There can, of course, be no direct foreign competition with this class through the import of products. Ten and four tenths per cent, numbering a little over 1,800,000, were occupied in trade and transportation; there can be no import of foreign products to compete with this class; it matters not to them what they move or what they may deal in. Forty-four per cent, numbering a little over 7,600,000, were occupied in agriculture as farmers and farm laborers, fruit cultivators, shepherds, and the like; and, lastly, twenty-two per cent, numbering a little over 3,800,000, were occupied in the manufacturing and mechanic arts and in mining. All who could or can be subjected to any change in the direction of their industry by alterations in the tariff policy of this country are substantially included in the two latter classes—i. e., in agriculture and manufactures.

According to the valuation of the products of agriculture, which was carefully revised by the Department of Agriculture after the census had been taken, the total value of the product of this great body of farmers and farm laborers, numbering 7,600,000, was a little under $4,000,000,000; that part of the product which consisted of sugar, tobacco, hemp, flax, wool, fruits, and the like, or of any other articles which could be in any part imported from abroad, came to less than $200,000,000—or less than five per cent of the total. It follows that not exceeding 350,000 to 400,000 of all who were occupied in agriculture could be subjected to any adverse influence by changes in the tariff, even if a larger proportion of these necessary articles were imported free of duty than had been imported while subject to duty; this estimate by persons being made in ratio to the relative value of different products.

In this consideration we of course leave out the Dominion of Canada. Owing to the difference in climate and to our advantage of position, there is a considerable exchange of products of agriculture between us and our neighbors in Canada; the amounts about balance. On the whole, we supply Canada with a rather larger part of the products of agriculture than they can supply to us. But the total traffic is relatively a very small part of our commerce, and may be wholly set aside, especially since the advocates both of protection and of freer trade are coming together in sustaining reciprocity among the nations on the American continents, especially with Canada.

On the other hand, in 1880, seventeen per cent of the value of

the product of agriculture found its home market only by sale for export to foreign countries; since then the proportion of exports has diminished; exports now range from ten to fifteen per cent in value of the total product of agriculture, varying with the relative supply and demand. It therefore follows that there is a vastly greater proportion of farmers and farm laborers whose home market depends upon the export trade than there are of those who might possibly be harmed even if, through imports of foreign articles of like kind, the demand for their own product were reduced.

When we take up the fourth class, manufacturing and mechanic arts and mining, one's judgment may vary as to the proportion whose home market depends upon export and the proportion whose product could be in part imported from a foreign country. In a rough and ready way it may be said that about one half the total number under this head of 3,800,000 were mechanics engaged in building trades or in other arts which can not be conducted on the factory principle, and which can not be interfered with or affected to their detriment by any import from any foreign country, but may be greatly benefited by the removal of taxes from the materials on which they work.

It is not worth while at this time to enter into the details of the classification of the other half of this number. Let it be admitted that there are about 1,900,000 to 2,000,000 people more or less, each of whom supports two others who are occupied distinctly in the manufacturing and mechanic arts, a part of whose work may be promoted by a tariff, and a part of whose work might perhaps be adversely affected by injudicious or revolutionary changes in the tariff policy of the country. The main point of this analysis is to call attention to the fact that at least eighty per cent, and probably more, of all who are occupied for gain in this country, have no direct interest in the tariff question except *as consumers;* while the remainder, about evenly divided between producers and consumers, may be affected more or less by changes in the tariff system to their benefit, or to their injury by injudicious or revolutionary changes.

There are probably twelve to fifteen hundred thousand persons occupied mainly in agriculture, but partly in the mining, mechanic, and manufacturing arts, whose home market depends absolutely on sales for export, and about ten to twelve hundred thousand occupied mainly in manufacturing and mining but in lesser proportion in agriculture, whose product would be in part imported if all duties on their products were abated. The reduction or abatement of duties on imports would necessarily promote exports, but how much imports would be increased or diminished can not be determined until the effect of the removal of duties on

crude or partly manufactured materials shall have given our domestic manufacturers an even chance to compete with others.

If it be admitted that the number of persons who are occupied in branches of agriculture, in manufactures, and in mining, whose home market depends wholly upon sales for export to other countries, exceeds the number of those who are occupied in any branch of domestic production of which a part might be imported under other conditions, then it follows of necessity that the only effect of duties upon imports has been or is to give a different direction to domestic industry from that which it would otherwise have taken. By such a course we do not add anything to or take away anything from the work that is to be done, but we do or may diminish the value of the domestic product from which all wages and profits are alike derived, by restricting its market, thus diminishing both general wages and profits in the attempt to increase them in specific directions. If the import of foreign goods, either crude or manufactured, is obstructed, then it follows of necessity that the export of the products of the farm and of the mine is to that extent obstructed, because we buy our foreign goods in exchange for food that we can not consume, for cotton that we can not spin, and for oil that we can not burn. "But," some one says, "if these foreign goods were manufactured at home, there would then be the same market for the product of the farm, the mine, and the forest, within the limit of our country, that now exists abroad." That view of the matter opens a very complex question. One can neither admit nor deny that position, because we have no experience to guide us. If, however, we did make the finished goods which we import into this country, the work in the factories in which they would be made would give employment to a very much less number of laborers than are engaged in the product of wheat and cotton which we now exchange for them. The home market which would be established in this artificial way would not take up anything like the quantity of products of the farm, the mine, and the forest that is now exported.

To show the absurdity of this conception, I can not do better than to quote from Mr. Butterworth's late speech. Having laid down his base-line principle with reference to the revision of the tariff, viz., that of reduction, he says: "Otherwise we should have five gentlemen, honorable and learned gentlemen, arbitrarily shuffling and disarranging, according to their own partially enlightened judgment, the more than fifty thousand industries of sixty millions of people, scattered over a vast continent, affecting directly and indirectly every home in the land, and having to do with all the nations of the earth."

Is it not a simple absurdity to expect the men whom we elect

to Congress, whose capacity or whose want of capacity we all know; many of whom we would never choose to manage a single large corporation, bank, or other commercial enterprise—to be able to choose and direct the occupations of this people? Are such men as our members of Congress to be empowered to say to us, This branch of work you shall do, and that branch of work you shall not do? What an absurdity! As if the people were not more competent than any Congress that ever existed, and more capable of managing their own affairs than the average member.

Again, what could be more absurd than the bugbear which is held up to us, of a community which would be exclusively devoted to agriculture, as the penalty for doing away with protection to domestic industry? Such a community never existed upon this continent except in the slave States. There, owing to slavery, we had a community almost wholly devoted to agriculture, and this was due to the coercion of law and the attempt to direct and control the labor of a great community by statute.

The first pamphlet ever printed by the writer, on Cheap Cotton by Free Labor, was devoted to an economic review of the slave system of labor. In that and in other articles I treated the system purely from the economic standpoint; I ventured to predict the changes which would come whenever the attempt to direct the labor of the community by the force of slavery should be removed. When the economic history of the present generation shall be written, it will give a picture of the most wonderful industrial revolution that has ever been witnessed, and it will do away forever with the conception that infant industries require even temporary support from the Government.

Witness the conditions. In 1865 the people of the Southern States were subjected not only to a revolution of institutions but of ideas. A considerable part of the most effective brain-power of the South was disfranchised as a penalty for having taken part in the rebellion, while the franchise was given to the most ignorant portion of the community. I fully justify the enfranchisement—the protection of the ballot was necessary to the black citizens of the United States—but I have never justified the disfranchisement. The result was as bad as it could be. We all know the history of what had been miscalled "carpet-bag" governments. They were not "carpet-bag" governments in any single State, so far as I can find out. The Northern men who took part in the readmission of the Southern States brought to their aid the best constitutional lawyers, and the organic laws of these States were most admirably framed and carried through by them. It was in specific legislation under these organic laws that the abuses happened; and, so far as I can learn, there was not one single instance or not one single law called into existence under these

conditions, in which the majority of white men were not Southern born and Southern bred in each so-called "carpet-bag Legislature." If, then, the ignorant blacks were led to pervert the trust that was imposed upon them, they were not led thereto by the Northern "carpet-baggers."

The very necessities of society made it necessary that this perversion of the powers of government should be stopped. It was done; and the old colored man at the Capitol in South Carolina explained the case in a single phrase when I asked him why the Republican Governor had been thrown out and Wade Hampton elected the year before; his answer was, "Yer can't put ig'nance top o' 'telligence and make it stay dar." It might be wise for those who are pressing the "Force bill" in the present Congress to take counsel from this old colored man. No force bill can "put ig'nance on top o' 'telligence and make it stay dar," but the enactment of such a measure will make it very plain that intelligence must displace ignorance of the present conditions of the South in many of the seats in the present House and Senate.

Under these adverse conditions—with that element of property which had been the main-stay of its citizens totally destroyed, its railway system torn up, its fields devastated, its fences burned, and many of its most important mills and works utterly destroyed; without capital, without inherited skill or aptitude—the South entered upon new fields of industry, exposed to the absolutely free and unrestricted competition of the Northern farmers, the Northern miners, the Northern manufacturers and the Northern artisans and mechanics in every branch of work.

No one can yet measure the progress which has been made in all the arts and industries which are necessary to civilized life in that great Southland. I have lately been on a hasty trip as far as New Orleans; I have witnessed the progress of white and black alike; progress upon the farm, in the field, in the great factory, in the workshop; progress in better conditions of life, in higher wages and in lower cost, in every town and city and wherever the railway has penetrated. It is a complete proof that diversity of employment establishes itself in spite of legislation and in spite of every bad form of taxation.

If you will glance over the analysis of the occupations of the people of the several States in the census of 1880, limiting your observation to those which had not been subject to the indignity of slavery, you will find that in a very short time after a State or Territory is open to settlement a certain balance of occupations establishes itself. Where the land is poor, as in New England, the larger number will be occupied in the manufacturing and mechanic arts; where the land is good, and the connection with the markets established, there may be for a time an excess in

agriculture as compared with other occupations; but after the normal conditions have become established by long settlement, as in Ohio, for instance—a State midway between the great prairies of the West and the factories of the East—we find that, although there is almost nothing produced in Ohio which could be imported from any foreign country, except a little wool and a little pig-iron —the two together constituting a small proportion of the product of the State and giving employment in 1880 to only thirty-two thousand out of one million persons then occupied for gain, rating persons in ratio to the relative value of products—the balance of occupations is about the same as that which has established itself on the average throughout the country. That average is forty to forty-five per cent in agriculture; ten to eleven per cent in trade and transportation; twenty to twenty-four per cent in professional and personal service; twenty to twenty-four per cent in manufacturing and mechanic arts and in mining.

The error which Mr. Gladstone has made in his article in the North American Review, to which Mr. Blaine replied, is of this nature. If I read his article correctly from his standpoint, I think he holds to the mistaken idea that the conditions of this country are more especially adapted to agriculture than to the manufacturing arts. A greater mistake could not be made. We possess greater advantages in our natural conditions and resources for the establishment of the mining industry, the mechanic arts and manufacturing, than we do in agriculture; and it is only due to our own blunders that we do not take the paramount position in the world in all these arts.

On the other hand, the reply of Mr. Blaine is full of yet more gross errors; not errors of opinion, but errors in the statement of facts. A more mistaken or erroneous statement of the course of economic history not only in Great Britain but also in this country, could hardly have been compiled than is found in Mr. Blaine's reply to Mr. Gladstone. A complete review of these two articles remains to be written.

So much for the analysis by persons. Now, if we adopt the theory so well laid down by Sir Robert Peel, after he had become convinced of the necessity of tariff reform, that if our condition had not been changed by our long persistence in a high tariff policy, we might choose the subjects from which to derive our revenue so as to interfere in the least degree either with commerce, agriculture, or manufactures—then the collection of our necessary revenue either from customs or from excise, or both, would become a very simple matter.

Let us for a moment take up this subject as a matter of theory and not of condition. Let us investigate our resources, and lay out an ideal method for collecting the national revenue wholly

from articles of voluntary rather than of necessary use, exempting everything that enters into the process of domestic industry, and taxing only those articles of which consumers may even be deprived of some part on account of the cost, and yet not be in any degree harmed or prevented from doing the most effective work of which they are capable; our object being to leave them free, so as to be able to obtain the largest annual product either by the application of the labor of the people of the country to its own resources, or indirectly by devoting their labor and capital to exchanging their own products for articles of necessity which may be of foreign origin, thus securing every article of necessity at the lowest cost, whether of foreign or of domestic origin. We could then raise all the necessary revenue from spirits, wines, beer, sugar, tea, coffee, silks, the finer textile fabrics of wool and cotton, laces, embroideries, furs, and fancy goods.

In order to apply this theory to our present condition, we may take as our basis the estimates of the Secretary of the Treasury for the ensuing fiscal year; but in so doing we must bear in mind that there has scarcely been a single estimate of prospective revenue submitted by any Secretary for the last twenty-five years which has not been *exceeded* in result; we must also bear in mind, in considering estimates of expenditure, that the recommendations of the Secretary of the Treasury have been more apt to be cut down by Congress than to be increased. At the present time, however, when our legislators are so anxious to dispose of a surplus in order that they may not be called upon to reduce taxation, we may find an exception to this latter rule; but for the purposes of study the ordinary conditions may be applied to the present case.

I might have attempted to lay down the basis for an act for the collection of our national revenue consistently with theory; of course, our condition will not permit the immediate application of this theory in its full force on account of our present conditions. A beginning, however, may be made; and, as the effects of the changes upon the progress of the country are developed, the work can proceed more and more rapidly.

No one can yet venture to forecast the prosperity of this country which would ensue the moment all crude and partly manufactured materials which are necessary in the main processes of our domestic industry were made free from duties, and were therefore supplied to our domestic manufacturers on even terms with our competitors in other countries. As one can not forecast the beneficial effect of the removal of these taxes, so no one can measure the injury which has been inflicted in consequence of the higher price of iron, steel, copper, lead, and other metals, of wool, chemicals and dye-stuffs, through this long term of high-tariff obstruction.

The true change may now be readily brought about, because the masters of the art of converting ore into iron have become aware that, owing to the scarcity of the fine ores suitable for the Bessemer metal, and of coal suitable for coking in Great Britain, the paramount control of the metal industry is passing to this country; it needs only the maintenance of the prices on the other side without a reduction of our own, to put us in a position of advantage for converting the crude metals into the higher forms in which ten or twenty men may be called for as compared to one in the production of pig-iron, copper, lead, and zinc. The prosperity which would ensue, as it did in Great Britain, after similar changes in the tariff were made, would tend to increase the consuming power of our own people in respect to the dutiable goods from which we should still derive a constantly increasing revenue. In this way we might gain a true protection to our domestic industry and the development of our home market; we might then take the paramount position in manufacturing arts as well as in agriculture to which we are entitled and yet enjoy the full benefit of low price and high wages.

I have endeavored to bring out this point very conspicuously, because many persons have looked upon those who are stigmatized as free-traders as if they advocated radical and injudicious changes in our revenue system, such as would launch us upon free trade without warning and without preparation. It is time to lay aside such prejudice with regard to those who advocate tariff reform in the direction of freer trade. I can not name a man among my associates in the study of these economic questions whose views are not substantially like my own and who is of any considerable influence or importance either as a student, economist, or legislator —not one who would not deprecate radical and revolutionary changes and who would not be guided by the most conservative ideas in the measures by which an ultimate but very profound change in our fiscal system would be brought about.

So far as one may judge by the course which has been taken in the House of Representatives and in the Senate, and by the position taken by ex-President Cleveland, the advocates of tariff reform and reduction first declared their adhesion to this proposed method by putting wool, hemp, flax, and many other articles which are most important products in the specific States from which they have been elected at once into the free list. May not men like the representatives from Texas, Kentucky, Tennessee, and Arkansas, who led off in the Committee of Ways and Means in taking off the taxes from wool, hemp, and flax, well be sustained in the brave stand which they have taken and on the lines on which they have carried their constituents with them? These men have also been willing, even eager, to grant rates of duty

on finished fabrics, such as might allay the fears of those who have been so long sustained by high duties that they dread any change. This is a reasonable method. The matter of importance is that we should be headed in the right direction. The time covered in the process of change may well correspond substantially with the life of the existing machinery which has been put at work at the high cost due to past and present conditions. All the machinery in our textile factories has cost at least fifty per cent if not seventy-five per cent more than that of our competitors in England, France, and Germany, on account of the tax upon materials of which that machinery is made. The life of machinery which is used in modern manufacturing ranges from ten to twenty years, averaging perhaps fifteen years. If the relief could at once be given by a removal of the duties upon crude and partly finished materials, with very moderate reduction on the finished goods, we should probably repeat the experience of Great Britain, and we should find, as Gladstone put it, that "the road to free trade is like the road to virtue; the first step the most painful, the last step the most profitable."

The manufacturers of England were formerly so afraid of pauper labor, so called, that when the proposition for the union of Ireland with England was pending, the purport of which was of course to bring Ireland under the same tariff system as that of England, they sent memorials to Parliament in opposition to the union, on the ground that they would be ruined by the cheap labor of Ireland. Of course, they were disappointed; they were not obliged to disturb or stop the factories of Lancashire and of Yorkshire, or to move them across the Channel. The manufacturers of England soon found out that the low-priced labor of people verging on pauperism is the dearest and not the cheapest labor that can be offered.

I will now close this over-long treatise upon the Method of Tariff Reform by submitting what may be called a practical budget. The figures are based upon the actual accounts of the Treasury of the United States, and upon what is hoped may be the maximum expenditure that will be warranted even by the present Congress.

First let me call attention to a few facts. Let us suppose that the civil war were ended—I mean the financial war, which will not be ended until the last dollar of debt shall have been paid and the last pension shall have fallen in. There are certain necessary annual appropriations which must be met year by year. How could we meet them with the least interference with the freely chosen pursuits of the people, and yet with due regard to the conditions in which we are? The ordinary expenses consist of, first, the cost of the civil service, legislative, judicial, consular, and the

like, and the cost of the collection of revenue; second, the support of the army and the construction of fortifications; third, the support of the navy, without expensive appropriations for construction; fourth, the deficiency in the postal service; fifth, the interest on the public debt; sixth, the support of the Indians; and seventh, the miscellaneous expenses. The sum of these regular or normal expenditures, aside from war obligations, according to the estimates submitted by the Secretary of the Treasury for the next fiscal year, which estimates until now have been more apt to be cut down than increased by Congress, amount to less than $200,000,000. We may set off a tax against each branch of expenditure, and the conclusion which we reach is rather singular.

Omitting fractions, the internal revenue from whisky more than pays the cost of the civil government. The excess added to the tobacco tax more than suffices to pay the army expenses and fortifications. The navy floats on beer, with a part of the beer tax to spare and carry forward. The income from the Indian trust funds meets the cost of the Indian Department. The miscellaneous permanent receipts of various kinds more than cover the miscellaneous permanent expenses; while the sugar tax and the revenue derived from imported liquors and tobacco cover the postal deficiency and the interest on the public debt, with $10,000,000 to spare.

Were it not for pensions and sinking funds, our pleasant vices, with the tax on sugar added, would support the Government on a very adequate scale, not very economically administered, and with a margin for contingencies of more than $10,000,000 to spend on rivers and harbors.

This is only one way of putting the case. It shows how easily we could cover all the normal or peace expenditures of the Government by taxing nothing but spirits, beer, tobacco, and sugar. But we are subject to war expenses and we must continue some war taxes for a term of years. We may therefore make up two accounts:

No. 1.

War Expenses:	
Current annual pensions, $65,000,000; arrears, $35,000,000	$100,000,000
Interest on war debt	31,500,000
Sinking fund	48,500,000
Total war expense	$180,000,000
War Taxes:	
Internal tax on whisky	$78,000,000
Internal tax on beer	27,000,000
Internal tax on tobacco	33,000,000
Duties on sugar and molasses	60,000,000
Elasticity in next fiscal year	2,000,000
Total war taxes	$200,000,000
Excess of war revenue carried forward	$20,000,000

No. 2.

Peace Expenditures:		
Civil service		$66,000,000
Army and fortifications		37,000,000
Navy		25,000,000
Indians		6,000,000
Postal deficiency		7,000,000
Miscellaneous		21,000,000
Rivers and harbors		10,000,000
Total		$173,000,000
Peace Revenue on Present Basis:		
Brought forward from the war taxes		$20,000,000
Miscellaneous permanent receipts, omitting so-called profit on silver coinage		30,000,000
Customs revenue on basis of calendar year ending December 31, 1889	$230,000,000	
Less sugar assigned to war expenses	60,000,000	
		170,000,000
Total		$220,000,000
Surplus available for reduction of taxation		47,000,000

On reference to the table of the revenue derived from imports, sorted according to their kind, given in the first part of this treatise, it will be found that—

Aside from sugar, necessary articles of food have been taxed annually between $10,000,000 and		$12,000,000
Articles in a crude condition necessary in the processes of domestic industry.	$13,000,000 to	14,000,000
Articles partly manufactured which are necessary in the processes of domestic industry	$23,000,000	
Less some duties which are imposed in order to adjust other duties to the internal taxes, etc	3,000,000	
		20,000,000
Total		$46,000,000

All this revenue can be spared. All these taxes are a useless burden upon domestic industry. This relief can be given within the surplus proved to exist, if this Congress does not waste the substance of the people in order to prevent a reduction of taxation.*

Of course, one can not enter into details in a magazine article. Judgment would be required in abating the duties upon crude and partly manufactured materials. Under these headings there may be a very few articles which it may be necessary to move

* Since this treatise was first prepared for submission to a private club, the dependent pension bill has been passed, which may increase the current annual obligation to $100,000,000 a year. If common sense ruled in fiscal legislation, a duty on tea and coffee would have been imposed to meet this increased obligation. But even this new burden will not prevent the application of this budget within two or three years by the next Congress—such is the elasticity of our revenue, in spite of all the stupidities of partisan legislation.

into another class, or on which duties would have to be maintained because of their close relation to finished products of a very similar kind. So long as we maintain a duty upon spool cotton, for instance, it would not be safe or judicious to remove all duties upon fine cotton thread which could be imported in the skein and reeled here. But these are all small matters of detail. Suffice that the revenue which is now derived from spirits, tobacco, beer, and sugar, from silks, furs, and fancy goods, and from laces, embroideries, and the fine textile fabrics which are articles of luxury rather than of utility, is so large that it would suffice to meet all the ordinary and all the extraordinary expenditures of the Government.

But there is another element to be considered. When a reform of the English tariff was laid down on these lines under the direction of Sir Robert Peel, even he could not anticipate the prosperity which would ensue from the removal of the little petty obstructions to the commerce of the globe, which had yielded only a small part of the customs revenue. He expected a deficiency in the revenue from the duties on imports in consequence of the abatement of the duties on the articles made free; and to meet this expected deficiency he carried a temporary income tax for three years, beginning in 1842 to end in 1845. But such was the stimulus given to industry, trade, and commerce with all the world, that the revenue on dutiable imports soon rose to the same amount that had been yielded before the reform. By 1845 the previous deficiency in the revenue had been surmounted and the Treasury of Great Britain had a surplus to dispose of for the first time in many years.

But the lesson had been learned. Opposition to tariff reform almost ceased; in 1845 another list of articles of more importance was added to the free list. Still it could not be conceived that the revenue would not be diminished and the income tax was again imposed for the term of three years. But again the revenue from dutiable imports increased rapidly, again the consuming power of the people had increased with their prosperity. Then came the Irish famine. The corn laws went by the board by Orders in Council, afterward justified by act of Parliament. The prosperity of England went forward by leaps and bounds. And in 1853 Gladstone completed the work that Peel had begun.

We have yet to learn how to increase the public revenue by the abatement of obnoxious and obstructive taxation; even the simple system which is herein presented, under which even an excessive expenditure can be met by a very simple system of taxation, under which every necessary article in our domestic manufactures will be free could it be put in force, would be immensely disappointing, and in the same way in which Peel and his coadjutors

were disappointed. The mass of the people, who are the great consumers both of domestic and of foreign products, would gain so much in their consuming power as to cause the revenue from dutiable imports to become greater than it had ever been before, even if we take off fifty million dollars of taxes now derived from such foreign imports as have been named above.

Again, while the ordinary expenditures of the Government may increase with the population, the burden of interest and of pensions will soon rapidly diminish; therefore I am justified in predicting that if this policy should be adopted and continue for fifteen years or during the life of existing machinery, in which interval all our processes of manufacturing would be readily adapted to the new conditions at a diminishing cost, we might then, if we chose, relieve every article of import from foreign countries from taxation, except spirits, beer, tobacco, and sugar, and perhaps relieve sugar by substituting some other less onerous tax, as the people of Great Britain have done within a very few years.

We might come to these conditions sooner if it were expedient, provided the mass of the people could be persuaded to put a moderate duty on tea and coffee as a substitute for duties on some other commodities. This, however, can hardly be expected; the great objection to the present removal of the duty on sugar is that, once off, it would be difficult to put it on again even if the public should become convinced that they had better put a tax on sugar than on wool, hides, lumber, leather, tin plates, salt fish, potatoes, and other articles of like kind.

Strange as it may seem, a small part of the members of the Senate and House of Representatives seem to believe that the dogma of "protection with incidental revenue" has some foundation in right and justice—notably the author of this catch-word or phrase, who has been pushed into temporary prominence as Chairman of the Committee of Ways and Means by the very sincerity of his convictions.

The greater part of the support of this measure is, however, given by the mis-representatives of their respective States, who can only be designated as political lacqueys or time-servers, many of whom are known to vote against their own convictions.

It happens that most of the representatives on the Democratic side who have not heretofore agreed with the majority of their own number upon this question, have either been removed by death or by failure to be re-elected. Hence comes the necessity for a choice of parties, if this question is to be the paramount one in politics. It is a pity, even a shame, that a plain, practical business question can not be taken out from party politics to be settled on its merits. What is there that we can do to bring this about? This is a meeting of representative business men who have here-

tofore voted, some with one party, some with another. Some are called protectionists, some are classed as free-traders, yet all may come to a practicable agreement on practical methods of tariff reform. If that agreement could be brought into effect both here and elsewhere, to the end that every candidate for election to Congress or to the Senate of the United States, whether named Republican or Democratic, would be given to understand that his election would depend upon his giving his support to methods of tariff reform which are consistent with common sense, such as I have attempted to bring before you, we might feel perfectly sure that the average candidate on either side would hasten to get the benefit of the first conversion to these views.

In the great struggle by which personal liberty was established, the men at arms knew no difference between Republican and Democrat. Loyalty to the principle of liberty was the sole test by which men were justified or condemned. May we not establish the same test in the struggle for relief from the burden of obstruction and destructive taxation?

When in the fullness of time, with due preparation, with careful consideration, and with consistent regard to all existing conditions, the object may be attained which is aimed at by every intelligent protectionist, tariff reformer, and free-trader alike; when all the conditions precedent have been safely established on the lines upon which we may now enter—we may begin the next century free from slavery, free from debt, free from destructive taxation, free from the cruel burden of great standing armies and navies. Then may the people of Massachusetts and all her sister States conduct their work and serve all nations as they serve themselves, sustained and governed by the principle which is engraved upon her own great seal:

Ense petit placidam sub libertate quietem.

[*Concluded.*]

SOME NATIVES OF AUSTRALASIA.*

By ELISÉE RECLUS.

TAKEN collectively, the Dayak populations differ from the civilized Malays by their slim figure, lighter complexion, more prominent nose, and higher forehead. In many communities the men carefully eradicate the hair of the face, while both sexes file, dye, and sometimes even pierce the teeth, in which are fixed gold buttons. The lobe of the ear is similarly pierced for the insertion of bits of stick, rings, crescent-shaped metal plates,

* From Oceanica, the fourteenth volume of Reclus's great illustrated work on The Earth and its Inhabitants, now in course of publication by D. Appleton & Co.

and other ornaments, by the weight of which the lobe is gradually distended down to the shoulder. In several tribes the skulls of the infants are artificially deformed by means of bamboo frames and bandages.

The simple Dayak costume of blue cotton with a three-colored stripe for border is always gracefully draped, and the black hair is usually wrapped in a red cloth trimmed with gold. Most of the Dayaks tattoo the arms, hands, feet, and thighs, occasionally also the breast and temples. The designs, generally of a beautiful blue color on the coppery ground of the body, display great taste, and are nearly always disposed in odd numbers, which, as among so many other peoples, are supposed to be lucky. Amulets of stone, filigree, and the like, are also added to the ornaments to avert misfortune. In some tribes coils of brass wire are wound round the body, as among some African peoples on the shores of Victoria Nyanza.

Many Dayak tribes are still addicted to head-hunting, a practice which has made their name notorious, and which but lately threatened the destruction of the whole race. It is essentially a religious practice—so much so that no important act in their lives seems sanctioned unless accompanied by the offering of one or more heads. The child is born under adverse influences unless the father has presented a head or two to the mother before its birth. The young man can not become a man and arm himself with the *mandau*, or war-club, until he has beheaded at least one victim. The wooer is rejected by the maiden of his choice unless he can produce one head to adorn their new home. The chief fails to secure recognition until he can exhibit to his subjects a head secured by his own hand. No dying person can enter the kingdom beyond the grave with honor unless he is accompanied by one or more headless companions. Every rajah owes to his rank the tribute of a numerous escort after death.

Among some tribes, notably the Bahu Trings, in the northern part of the Mahakkam basin, and the Ot-Damons of the upper Kahajan, the religious custom is still more exacting. It is not sufficient to kill the victim, but before being dispatched he must also be tortured, the corpse sprinkled with his blood, and his flesh eaten under the eyes of the priest and priestesses, who perform the prescribed rites. All this explains the terror inspired by the Dayaks in their neighbors, and the current belief that they are sprung from swords and daggers that have taken human form. With the gradual spread of Islam the Dayaks of the British and Dutch possessions are slowly abandoning their bloodthirsty usages. At the same time the head-hunters themselves, strange to say, are otherwise the most moral people in the whole of Indonesia. Nearly all are perfectly frank and honest. They scru-

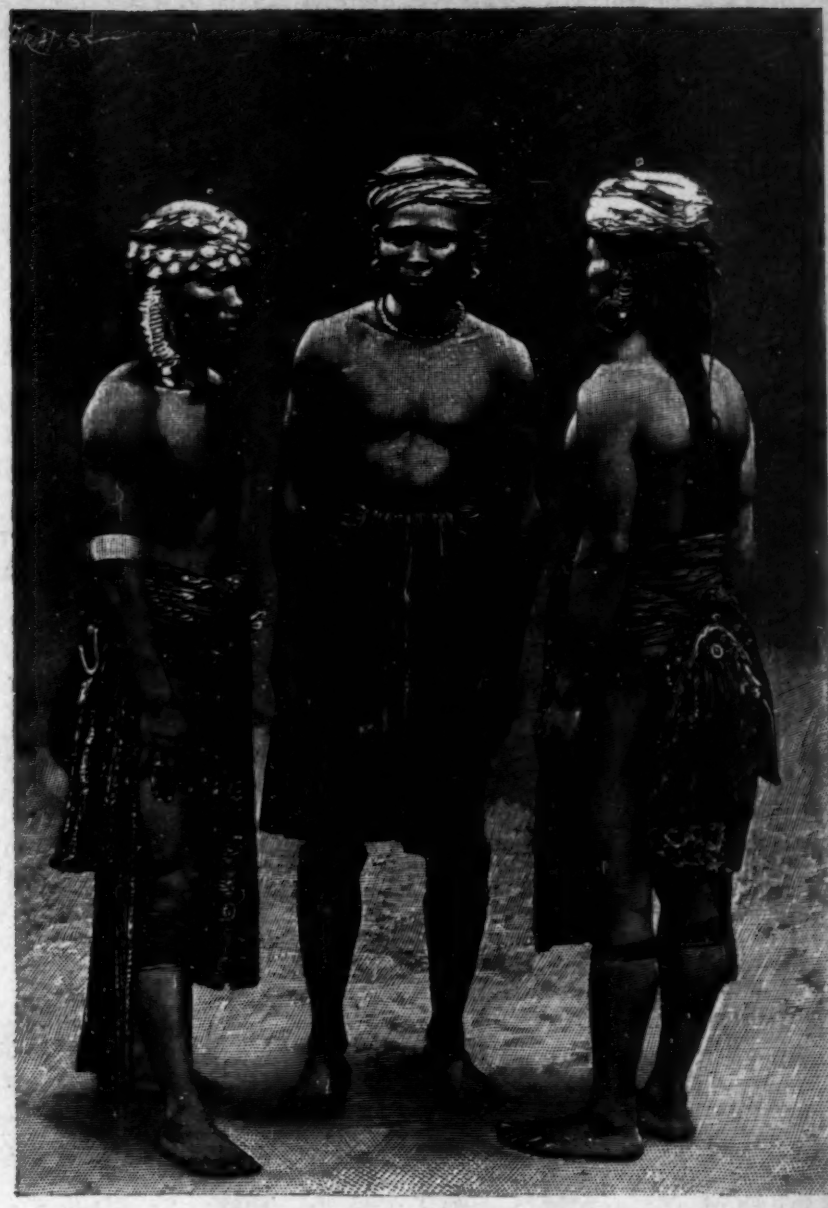

FIG. 1.—DAYAK TYPES, BORNEO.

pulously respect the fruits of their neighbors' labor, and in the tribe itself murder is unknown.

The population of New Guinea, variously estimated at from half a million to two millions, comprises a very large number of groups differing greatly from each other in stature, complexion,

shape of the skull, and other physical features, as well as in their usages and mental qualities. Several tribes approach the Indonesian type, as found in Borneo and Celebes, while others resemble the Malays, and are described by travelers as belonging to this race. But, although there is no ethnical uniformity, as seemed probable from the reports of the early explorers, the Papuan element, whence the great island takes the name of Papuasia, certainly predominates over all others.

On the whole the Papuans are somewhat shorter than the Polynesians, the average height being about sixty-two to sixty-four inches. They are well proportioned, lithe, and active, and display surprising skill both in climbing trees and in using the feet for prehensile purposes. Most Papuans have a very dark skin, but never of that shiny black peculiar to the Shilluks of the White Nile, the Wolofs of Senegal, and some other African peoples. The eyebrows are well marked, the eyes large and animated, the mouth large but not pouting, the jaw massive. Among the northwestern Papuans, regarded by Wallace as representing the type in its purity, the nose is long, arched, and tipped downward at the extremity, and this is a trait which the native artists never fail to reproduce in the human effigies with which they decorate their houses and boats. Another distinctive characteristic of numerous tribes is their so-called mop-heads, formed by superb masses of frizzly hair, no less abundant than that of the Brazilian Cafusos, and, as in their case, possibly indicating racial interminglings.

However backward they may be in other respects, most of the Papuans are endowed with a highly developed artistic feeling, and as carvers and sculptors they are far superior to most of the Malayan peoples. Having at their disposition nothing but bamboos, bone, banana-leaves, bark, and wood, they usually design and carve with the grain—that is, in straight lines. Nevertheless, with these primitive materials they succeed in producing extremely elegant and highly original decorative work, and even sculpture colossal statues representing celebrated chiefs and ancestors. Thanks to this talent, they are able to reproduce vast historic scenes, and thus record contemporary events. Numerous tribes have their annals either designed on foliage or depicted on rocks in symbolic writing. The skulls of the enemies slain in battle, which are carefully preserved to decorate the houses, are themselves often embellished with designs traced on masks made of wax and resin. On the banks of the Fly River these skulls are also used as musical instruments.

The island of Tasmania has already been completely "cleared" by the systematic destruction of its primitive inhabitants, who were estimated at about seven thousand on the arrival of the

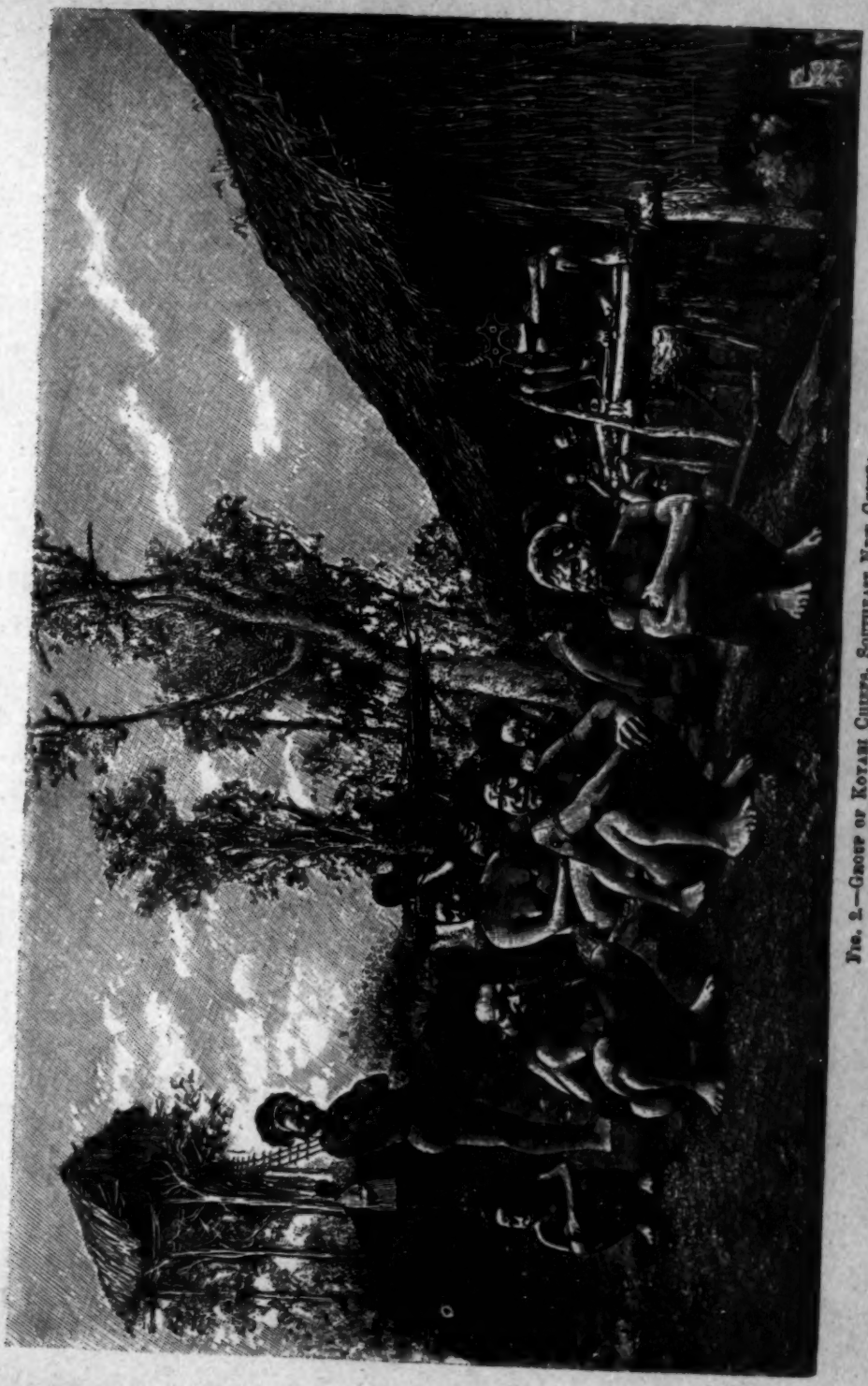

FIG. 2.—GROUP OF KOIARI CHIEFS, SOUTHEAST NEW GUINEA.

whites, and who were said to be of a remarkably gentle and kindly disposition. On December 28, 1834, the last survivors, hounded down like wild beasts, were captured at the extremity of a headland, and this event was celebrated as a signal triumph. The successful hunter, Robinson, received a government reward of six hundred acres and a considerable sum of money, besides a public subscription of about eight thousand pounds.

The captives were at first conveyed from islet to islet, and then confined to the number of two hundred in a marshy valley of Flinders Island, washed by the stormy waters of Bass Strait. They were supplied with provisions and some lessons in the catechism; their community was even quoted as an example of the

FIG. 3.—LALLA ROOKH, THE LAST TASMANIAN.

progress of Christian civilization. But after ten years of residence in this place of exile more than three fourths of the natives had perished. Then pity was taken on them, and the twelve surviving men, twenty-two women, and ten children, nearly all half-breeds, were removed to a narrow promontory at Oyster Cove, near Hobart, and placed under some keepers, who enriched them-

selves at their expense. In 1860 the Tasmanian race was reduced to sixteen souls; in 1869 the last man perished, and in 1876 "Queen" Truganina, popularly known as Lalla Rookh, followed her people to the grave. But there still survived a few half-castes, and in 1884 a so-called "Tasmanian" woman obtained a grant of land from the Colonial Parliament.

The Fijians present affinities both with the western Melanesians and eastern Polynesians, and are at least partly of mixed descent, although the majority approach nearest to the former group. They are tall and robust, very brown and coppery, sometimes even almost black, with abundant tresses intermediate between hair and wool. Half-breeds are numerous and are often distinguished by almost European features. Till recently they went nearly naked, wearing only the loin-cloth or skirt of vegetable fiber, smearing the body with oil, and dyeing the hair with red ochre. The women passed bits of stick or bark through the pierced lobe of the ear, and nearly all the men carried a formidable club; now they wear shirts, blouses, or dressing-gowns, or else drape themselves in blankets, and thus look more and more like needy laborers dressed in the cast-off clothes of their employers. They display great natural intelligence, and, according to Williams, are remarkable for a logical turn of mind, which enables Europeans to discuss questions with them in a rational way. Their generosity is attested by the language itself, which abounds in terms meaning *to give*, but has no word to express the acts of borrowing or lending. Compared with their Polynesian neighbors, they are also distinguished by much reserve. Their *meke*, or dances, always graceful and marked by great decorum, represent little land or sea dramas, sowing, harvesting, fishing, even the struggles between the rising tides and rocks.

Cannibalism entered largely into the religious system of the Fijians. The names of certain deities, such as the "god of slaughter," and the "god eater of human brains," sufficiently attest the horrible nature of the rites held in their honor. Religion also taught that all natural kindness was impious, that the gods loved blood, and that not to shed it before them would be culpable; hence those wicked people who had never killed anybody in their lifetime were thrown to the sharks after death. Children destined to be sacrificed for the public feasts were delivered into the hands of those of their own age, who thus served their apprenticeship as executioners and cooks. The banquets of "long pig"—that is, human flesh—were regarded as a sacred ceremony from which the women and children were excluded; and while the men used their fingers with all other food, they had to employ forks of hard wood at these feasts. The ovens also in which the bodies were baked could not be used for any other purpose. Notwith-

standing certain restrictions, human flesh was largely consumed, and in various places hundreds of memorial stones were shown which recalled the number of sacrifices.

FIG. 4.—TATTOOED NATIVE OF THE MARQUESAS ISLANDS.

From the ethnical standpoint Polynesia forms a distinct domain in the oceanic world, although its inhabitants do not appear to be altogether free from mixture with foreign elements. The vestiges of older civilizations differing from the present even prove that

human migrations and revolutions have taken place in this region on a scale large enough to cause the displacement of whole races. The curious monuments of Easter Island, although far inferior in artistic work to the wood-carvings of Birara and New Zealand, may perhaps be the witnesses of a former culture, no traditions of which have survived among the present aborigines. These monuments may possibly be the work of a Papuan people, for skulls found in the graves differ in no essential feature from those of New Guinea.

The Polynesians, properly so called, to whom the collective terms Mahori and Savaiori have also been applied, and who call themselves Kanaka, that is, "men," have a light-brown or coppery complexion, and rather exceed the tallest Europeans in stature. In Tonga and Samoa nearly all the men are athletes of fine proportions, with black and slightly wavy hair, fairly regular features, and proud glance. They are a laughter-loving, light-hearted people, fond of music, song, and the dance, and where not visited by wars and the contagion of European "culture," the happiest and most harmless of mortals. When Dumont d'Urville questioned the Tukopians as to the doctrine of a future life, with rewards for the good and punishment for the wicked, they replied, "Among us there are no wicked people."

Tattooing was wide-spread, and so highly developed, that the artistic designs covering the body served also to clothe it; but this costume is now being replaced by the cotton garments introduced by the missionaries. In certain islands the operation lasted so long that it had to be begun before the children were six years old, and the pattern was largely left to the skill and cunning of the professional tattooers. Still, traditional motives recurred in the ornamental devices of the several tribes, who could usually be recognized by their special tracings, curved or parallel lines, diamond forms, and the like. The artists were grouped in schools, like the Old Masters in Europe, and they worked not by incision as in most Melanesian islands, but by punctures with a small, comb-like instrument slightly tapped with a mallet. The pigment used in the painful and even dangerous operation was usually the fine charcoal yielded by the nut of *Aleurites triloba*, an oleaginous plant used for illuminating purposes throughout eastern Polynesia.

In Samoa the women were much respected, and every village had its patroness, usually the chief's daughter, who represented the community at the civil and religious feasts, introduced strangers to the tribe, and diffused general happiness by her cheerful demeanor and radiant beauty. But elsewhere the women, though as a rule well treated, were regarded as greatly inferior to the men. At the religious ceremonies the former were

FIG. 5.—SAMOAN WOMEN.

noa, or profane; the latter *ra*, or sacred; and most of the interdictions of things *tabooed* fell on the weaker sex. The women never shared the family meal, and they were regarded as common property in the households of the chiefs, where polygamy was the rule. Before the arrival of the Europeans, infanticide was systematically practiced; in Tahiti and some other groups there existed a special caste, among whom this custom was even regarded as a duty. Hence, doubtless, arose the habit of adopting strange children, almost universal in Tahiti, where it gave rise to all manner of complications connected with the tenure and inheritance of property.

In Polynesia the government was almost everywhere centered in the hands of powerful chiefs, against whose mandates there was no appeal. A vigorous hierarchy separated the social classes one from another, proprietors being subject to the chiefs, the poor to the rich, the women to the men; but over all custom reigned supreme. This law of *taboo*, which regulated all movements and every individual act, often pressed hard even on its promulgators, and the terrible penalties it enforced against the contumacious certainly contributed to increase the ferocity of the oceanic populations. Almost the only punishment was death, and human sacrifices in honor of the gods were the crowning religious rite. In some places the victims were baked on the altars, and their flesh, wrapped in taro-leaves, was distributed among the warriors.

Yet, despite the little value attached to human life, the death of adult men gave rise to much mourning and solemn obsequies. Nor was this respect for the departed an empty ceremonial, for the ancestors of the Polynesians were raised to the rank of gods, taking their place with those who hurled the thunderbolt and stirred up the angry waters. A certain victorious hero thus became the god of war, and had to be propitiated with supplications. But the common folk and captives were held to be "soulless," although a spirit was attributed to nearly all natural objects.

In his book on The Cradle of the Aryans, Prof. Rendall takes the position of an independent critic. Reviewing the theories that have been offered, and the arguments, both in favor of an Asiatic and of a European origin, he concludes that the portion of the white race to which the Indo-European languages properly belong had its first home in southern Scandinavia, and is best represented by the Swedes and Norwegians of the present day. Father Van den Gheyn, on the other hand, in his recently published pamphlet, L'Origine Européenne des Aryas, sums up the discussion from the point of view of the old theory of a home in the basin of the Oxus and Jaxartes. M. Reinach, reviewing his book, opposes the idea of a European home, but commits himself no further than to say that the spot is "somewhere in Asia."

KING BOMBA'S PHILOSOPHICAL CATECHISM.

By Prof. E. P. EVANS.

THE proper education of a prince and heir to the throne has been regarded from time immemorial as one of the most perplexing problems of pedagogics. Especially in the past ages of absolutism, when the monarch was the source of all authority, it was a matter of immense importance that the man whose will was to be the law of the land, and upon whose merest whim the weal or woe of a whole people depended, should, as a child, be trained up in the way he should go, and, as an adult, should not be permitted to depart from it.

In the Orient, where the sovereign was revered as a demi-divine incarnation and plenipotentiary delegate from heaven for the administration of justice on earth, he was also supposed to be supernaturally endowed with wisdom from on high—a pleasing fiction, which still survives in the claims of kings to wear their crowns and wield their scepters "by the grace of God." As a natural sequence of this theory, scions of royal stock were confided to members of the sacerdotal order for their education. In India the Brahman claimed for his caste all posts of honor and emolument in the realm, and all positions of influence near the person of the ruler. Not only was it deemed essential to the power and permanence of the dynasty that he should perform the duties of court priest (*purohita*), but he also arrogated to himself the functions of court fool (*vidûshaka*); in his overweening ambition and insatiable greed of supremacy, he could bear no rival near the throne, even though the competitor were a man of motley.

It was likewise the privilege of the Brahman to be pedagogue in perpetuity to the royal family. His son or some member of his caste was as sure of succeeding to the ferule as the king's son or some prince of the blood was of inheriting the scepter; and, judging from what we know of the manuals of instruction, in which his teachings were embodied, he was eminently worthy of his high office. Thus the Hitopadesá was composed or rather compiled by Vishnu Sárman for several young princes who were his pupils; and it would be difficult to find in the whole vast range of didactic literature any work containing in the same compass a greater sum of homely wisdom and a larger number of prudential maxims and ethical rules for the conduct of life than are compressed into this little treatise on deportment, or *nîtividyâ*, a word which the modern masters of this science would translate by *savoir vivre*. This Kind Counsel, as the title Hitopadesá signifies, is illustrated and enforced by a series of fables and kindred

stories, skillfully woven together into a consecutive narration, which has remained for centuries the unsurpassable model of all productions of a like character. In Greek literature we have Xenophon's Cyropædia, which gives an imaginary picture of the education of the elder Cyrus, in order to present the ideal of a prince whose moral and intellectual faculties have been developed according to the principles of the Socratic philosophy. Less worthy of note, and yet not devoid of significance, is the De Clementia ad Neronem Cæsarem of Seneca, whose imperial pupil Nero does not redound to his credit as a tutor, and whose own conduct did not always exemplify his fine ethical maxims. In the sixteenth century Duke Julius, of Brunswick, began with his Deutscher Fürstenspiegel the fabrication of those moral mirrors in which princes are enabled to see themselves as others see them.

The Prince of Machiavelli is a different kind of production, being less a pedagogical than a political treatise—not so much an exposition of ethical principles as an enforcement of practical policy. It is the final, energetic effort of a sincere patriot to rescue his country from the demoralizing and disintegrating influences, aristocratic, democratic, and hierarchical, which made it the prey of factions from within and foreigners from without. If the remedy prescribed is drastic, the disease was also desperate.

Of all modern works belonging to the class under consideration, The Adventures of Telemachus, written by Fénelon for the instruction and guidance of the grandsons of Louis XIV, holds perhaps the highest place in literature. But the ideal of conduct, which the Archbishop of Cambrai here offers for imitation, is so pure and exalted, that the king regarded the book as a satire on his reign and forbade its publication. It was also the common opinion of his courtiers that Calypso was the Marquise de Montespan, Antiope the Duchesse de Bourgogne, and Sesostris no less a personage than the Grand Monarch himself. No one, nowadays, in reading Fénelon's masterpiece of fiction, thinks of the didactic purpose for which it was written; we are attracted solely by the charm of style and the perfection of artistic form which have made it classic.

Very different in this respect is the notorious Philosophical Catechism collaborated by King Ferdinand II and Monsignore Apuzzo, Archbishop of Sorrento, for the use of the Hereditary Prince and of the Most Faithful People of the Two Sicilies. This book, which appeared in 1850, was written to justify the perfidies and perjuries of King Bomba, and also, *ad usum Delphini*, to inculcate and perpetuate the principles of monarchical absolutism.

After the suppression of the Revolution of 1848, and the abrogation of the reforms which this movement had temporarily effected, the sovereign of the Two Sicilies began to manifest an

extraordinary interest in diffusing what he deemed useful information among his benighted subjects. He made a Collection of Good Books in favor of Truth and Virtue, in which the doctrine of the divine right of kings and the duty of passive obedience on the part of their subjects were taught in the most emphatic terms. These cheaply printed pamphlets and little volumes were scattered broadcast over the country; but as the great majority of the people were unable to read them, owing to the general illiteracy which his system of government had produced, the priests were instructed to communicate the contents of them to their parishioners, and to make the ideas contained in them the subject of frequent discourse. His Majesty also caused to be published a New Philosophic-Democratic Vocabulary indispensable to every one who desires to understand the New Revolutionary Language, in which the logic of the Holy Office is combined with the rhetoric of the barracks and of Billingsgate to heap contempt upon liberal opinions. But the famous series reaches its climax in the aforementioned Catechism, the *capolavoro* of Monsignore Apuzzo, who, to the exercise of his archiepiscopal functions, added the sinecure of Superintendent of Public Instruction and the confidential post of tutor to the crown prince.

In the preface the author addresses himself directly to "princes, bishops, magistrates, instructors of youth, and all men of goodwill," and enjoins upon them to use their authority, their money, and their influence to secure the widest possible distribution of his work. Those who have control of the public funds in the cities of the realm, he says, should apply them generously and systematically to this worthy end, and assures these officials that God will bless their pious embezzlements.

The following is a translation of the first chapter, which treats of Philosophy:

"*Disciple.* What is philosophy?

"*Master.* It is the science of truth, or rather the science which teaches us to distinguish truth from error.

"*D.* Is it necessary to teach this science to very young persons?

"*M.* It would not be necessary, since they would learn it gradually from experience and from the words and writings of honest and wise men; but at the present time it is necessary that Christian teachers should begin early to instruct their pupils in the true philosophy, in order that they may not learn from others a perverse and false philosophy.

"*D.* Why is it that some persons wish to teach a wicked philosophy, and desire to diffuse error rather than truth?

"*M.* Because they are vicious and bad, and wish that all other men should become vicious and bad.

"*D.* Who are those who teach a false and perverse philosophy?

"*M.* They are the liberal philosophers.

"*D.* Would it not be well to massacre all these corrupters and deceivers of the human race?

"*M.* No, my son; we should detest their errors, but should regard their persons with the eye of charity, pray God to convert them, pardon the offenses which they commit, do good to them, and succor them in their necessities. These are the doctrines of Christianity, and we should show what a difference there is between the followers of the liberal philosophy and the followers of the gospel.

"*D.* What are the effects of the doctrines taught by the liberal philosophers?

"*M.* They cause the decay of religion, bring disaster upon the state, produce the slaughter of war, the weeping of mothers, and the general misery of the people, as may be seen in all those countries whose inhabitants have let themselves be led astray by these fatal and foolish notions. And, above all, they cause the eternal damnation of souls, because he who lives contrary to the law of God on earth can not expect anything but hell in the next world.

"*D.* Are all liberals wicked in the same degree?

"*M.* Not all, my son, because some are willful deceivers, and others are wretchedly deceived; nevertheless, they all go the same way, and, if they do not turn from this path, will all reach the same goal.

"*D.* How are liberal philosophers to be recognized?

"*M.* When you see any one who keeps away from the sacraments and the religious services, who does not go to church, or, if he sometimes goes there, acts irreverently and disrespectfully, who ostentatiously neglects to take off his hat before the images of Jesus Christ and the saints, and is ashamed to be seen making the sign of the cross; when you hear any one joking about heaven and hell, speaking evil of the prince or of the government, deriding priests and friars and ecclesiastical persons; when, finally, you perceive any one who is glad to learn of the progress of rebellions and the success of rebels, and who disapproves of the vigorous acts of the legitimate authorities, and receives with signs of sorrow news favorable to the preservation of religion, of the sovereign power, and of public tranquillity—then you can say for certain that all these are liberal philosophers.

"*D.* Are all those who wear whiskers and full beards liberal philosophers?

"*M.* Not all, because many people merely follow the fashion in wearing the beard.

"*D.* Are not young men, then, permitted to follow the fashion?

"*M.* When the fashions are neither obscene nor ridiculous,

each one is free to follow them if he sees fit, provided, however, that such or such a fashion may not be generally recognized as a mark of adhesion to a bad class. The garb of a hangman or of an assassin may not be scandalous in itself, but no honorable and respectable man would clothe himself as an assassin or hangman in order to be in fashion. In like manner wise and Christian persons ought to be ashamed to imitate in their apparel the liberals and liberal philosophers, and, for this reason, whoever nowadays under the pretext of adapting his dress to the mode plasters his face with those demi-periwigs, shows signs of little honesty, or at least of little sense."

This is a fair specimen of the puerility of the archbishop's reasoning. He then proceeds to discuss the origin and nature of human society, which, he maintains, is a divine institution, and began to exist essentially in its present constitution with the creation of man. The theory of a primitive state of savagery, out of which the race was gradually evolved, he denounces as a figment of the imagination, having no more reality than the dog with seven heads or the sea-creature half fish and half maiden described by the poets. "Modern philosophers, for their own base ends, have feigned to believe in such a state of nature, as they call it, whereas it should be called a state contrary and repugnant to nature." The moral which the Right Reverend Apuzzo draws from his doctrine is, that society being an institution established by God, man has no right to change it under the pretext of reform or by the force of revolution, thus impiously endeavoring, by overturning the thrones of divinely appointed kings, and subverting the social, civil, and religious arrangements which God has ordained, to improve upon the wisdom of the Omniscient.

As regards liberty, he says it would be madness and blasphemy to maintain that the freedom of the gospel has anything in common with the freedom preached by modern philosophers. What the redemption of Christ freed man from was the condemnation and slavery of sin, and from the dominion of the devil. "Before his advent, demons tormented and afflicted the human race in a thousand ways, but Jesus Christ so effectually released mankind from that scourge, and so conquered the power of hell, that nowadays one scarcely knows that there are any such creatures as demons." Was ever any utterance of even the clerical mind more *naïve* than this! All aspirations and struggles for a freedom differing from his definition of the freedom of the gospel he denounces as destructive of human happiness and offensive to the Saviour of the world.

In the chapter on equality, we are told that men are tall, short, smart, stupid, learned, ignorant, virtuous, vicious, rich, poor, strong, and feeble, and that it is therefore impossible for them

to be all equal. Equality before the law, with which liberal philosophers seek to flatter the vanity and excite the passions of the populace, is also a chimera. To punish all persons equally for the same overt acts would be manifestly unjust. Throwing a handful of mud at a common laborer should not be visited with as severe a penalty as throwing a handful of mud at a nobleman, because in the case of the laborer the act only occasions a slight inconvenience, while in the case of the nobleman it involves a grievous insult. By such plausible but wholly impertinent illustrations the shrewd archbishop seeks to shirk the main principle, and to impose upon the simple-minded, who may not have wit enough to detect the fallacies of his reasoning, and to perceive that equality before the law does not imply the necessity of ignoring all circumstances, motives, and effects attending a culpable action. He admits, in conclusion, that all men should be equal in the eye of justice, but asserts that "such an equality is already enjoyed by the inhabitants of the whole civilized world, so that there is no need of the liberal philosophers wasting their breath in proclaiming it." If some persons now and then suffer wrong, "this is due to the wickedness of the human heart, and not to any defects of institutions and laws." That it is, however, the object of laws and institutions to restrain the wickedness of the human heart, and that so far as they fail to do this they are defective, is a point wholly ignored.

After the close of the Franco-German War, the cities of the fatherland began to grow with unwonted rapidity, and many persons of the baser sort became owners of urban habitations, and in their pride of acquisition waxed exceedingly arrogant. A citizen of Munich, who had suddenly risen from the low estate of a handicraftsman to the dignity of a householder, posted up in the lower halls of his tenements a long list of printed rules and regulations to be observed by his tenants, who were not only informed when they must clean and light the stairs, and when they might or might not play on musical instruments, but also received definite and minute instructions touching their personal relations to himself, how they must greet him in passing, and must treat him with proper respect on all occasions. Having specified all the cases which he could think of, and fearing lest any loophole should be left by which obligations might be evaded, he laid down, in a concluding paragraph, the following general principle: "In short, the tenant has no rights, but only duties."

According to Monsignore Apuzzo, God has regulated the universe on the same principle, and man has no rights in opposition to the sovereigns who rule over him, but only duties toward them. "The law of God commands kings and rulers not to be tyrannical and not to oppress their subjects unnecessarily, and thereby guar-

antees to the people all the liberty they can enjoy without disturbing the social order." But as the sovereign alone is to decide what degree of oppression is necessary, and as there is no means of enforcing the law of God in case he sees fit to violate it, this guarantee of the liberty of the people seems to be of the slenderest and filmiest texture.

"The people of themselves have no right to determine what shall be the constitution and fundamental laws of the state, since this would be a limitation of sovereignty, which can not be conditioned and circumscribed except by itself, otherwise it would not be that supreme power established by God for the good of society." Even if a king has sworn to observe the constitution of the realm, he may set it aside if he finds it prejudicial to the exercise of his sovereignty and injurious to the highest interests of the state. "An oath can never be permitted to become a bond of iniquity, or a cause of harm to the people. Besides, the head of the Church has been authorized by God to absolve consciences from oaths, whenever he thinks there are good reasons for doing so. Even if a monarch should violate the constitution and laws of the country inconsiderately and without just cause, universal contempt and censure would be the only possible penalty for such an act. The supreme power may be praised or blamed, but can not be judged or condemned by any other power, since it is supreme. The people must accept the result with resignation, and will lose nothing thereby, because the fundamental laws are the work of man, but the sovereign power is the work of God.

"*D.* But suppose the king burdens his subjects with enormous taxes and squanders the money of the state, would not the revolt of the people be justifiable?

"*M.* No, it would not be justifiable, because the people have no right to judge of the necessities and expenditures of the sovereign, and the Holy Spirit through the mouth of Saint Paul has commanded the people to pay tribute, but has nowhere said that they should audit the accounts of kings.

"*D.* When the king cruelly abuses and does not respect the lives and blood of his subjects, would not revolt and revolution be justifiable?

"*M.* Not at all, because the people are not judges and avengers of injuries done them by private persons, and much less of those inflicted upon them by princes whom God has appointed to rule over them."

As regards freedom of opinion, every man is at liberty to entertain whatever opinions he pleases, and the government can not persecute him on this account, because it has no means of knowing his opinions. But when these secret thoughts and judgments of the mind are expressed in words, whether spoken or written,

they cease to be mere opinions and become overt acts, and are, as such, subject to the scrutiny and control of the public authorities. It is not only the right but also the duty of the supreme power to prevent the promulgation and to punish the diffusion and propagation of false and pernicious opinions, which imperil the existing religious, political, and social institutions. "God did not endow men with speech in order that they might utter absurdities and blasphemies, nor favor the invention of printing in order that it might serve to excite scandals, spread abroad impiety, and stir up the people against the powers that be, which are ordained of him." What kind of opinions are dangerous and injurious, it is, of course, for sovereigns, aided and advised by sacerdotal counselors to decide, and from their decision there is no appeal.

The most perfect form of civilization, according to Monsignore Apuzzo, is the mean between extreme ignorance and excessive knowledge. "Of course it is not meant to inculcate absolute ignorance, and to imply that men of the lower classes should live like beasts and blocks of stone, but that each person should be taught what is suitable to his class, and avoid that superfluity which can only prove harmful and troublesome to him. The Holy Spirit says through the mouth of Saint Paul that one should not know more than is convenient, and should be content to know with moderation, '*non plus sapere quam oportet sapere sed sapare ad sobrietatem*'; and these words of the apostle are addressed not only to the learned, but to men of all classes. For laborers and peasants, moderation consists in knowing the catechism and the vocal prayers, and nothing more. For mechanics and shopkeepers, moderation consists in knowing how to read, write, and cipher a little, and nothing more. For the professional classes, moderation consists in studying merely what pertains to their professions; and for the higher classes, moderation consists in learning what they can, provided they do not abuse the teachings of man by setting them in opposition to the teachings of God. This is what is called knowing soberly, and these are the limits within which the spread of learning, culture, and enlightenment must be kept."

These are the views of a man who was the highest ecclesiastical dignitary and the Superintendent of Public Instruction in the kingdom of the Two Sicilies under Ferdinand II; and this is the sort of sophistical stuff with which the crown prince, who afterward ascended the throne as Francis II, was systematically crammed. His education was entirely in the hands of Jesuits, and it was in this wise that they carried it on. No wonder that, as king, he was a gloomy and narrow-minded bigot, the helpless puppet of priests, utterly alien to the prevailing spirit of the age and the noblest aspirations of his time, and that Garibaldi's mere

presence in southern Italy sufficed to cause his scepter to fall from his impotent grasp.

In the concluding chapters of his Philosophical Catechism our author ridicules love of country as a shallow sentiment, censures patriotism as sedition, burns holy incense under the noses of the score of petty potentates who were then the curse of Italy, praises foreign domination, extols the "loyal and Christian" house of Hapsburg, and even invokes the blessing of heaven upon the Austrian soldiers, and has the impudence to assert that there is not a foot of soil in the whole peninsula that has not been freed and saved by them.

The rapid march of events since 1860 has now made it seem almost incredible that such a work, worthy of the darkest period of the middle ages, should have been written, approved by the Church and the state, and circulated as a public document in southern Italy less than fifty years ago.

It is at present almost impossible to obtain a copy of the original volume; but the people of the Two Sicilies had no sooner achieved their independence than the liberal party at Naples reprinted it as a monument to the deposed Bourbon dynasty—a monument that performs the functions of a pillory.

WILD HORSES.

By Dr. EDOUARD L. TROUESSART.

THE primitive stock of the domestic horse has until recently been considered wholly extinct. A few more or less numerous herds of horses called *tarpans* are living in a state of freedom in the steppes of central Asia, but they are the descendants of domestic horses that have become wild, and do not differ much more from the domestic races of the same country than the half-wild horses of the Landes and of La Camargue, in the south of France, differ from the horse of Tarbes or the Pyrenees.

There are also found in the Asiatic steppes bands of really wild animals, the hemiones, onagras, or fertile mules of the ancients, which are not true horses, but, notwithstanding their shorter ears, more resemble the ass and mule. They are widely scattered in Asia and form three distinct species, of which the best known is the Indian hemione (*Equus hemionus*, var. *onager*), the onagra of Pallas and the ancients, the *ghor khur* of the Hindoos, the *ghour* or *kherdecht* of the Persians, and the *koulan* of the Kirghiz—a species common in zoölogical gardens, where it is easily bred.

It inhabits the Cutch or Indian Desert and the steppes of Tur-

kistan, where the caravans going from Persia to Yarkand often meet numerous droves of these animals. Farther north and east, on the central plateau of Asia, lives the hemione of Thibet (*Equus hemionus* proper), the *kiang* or *disightai* of the Thibetans, which much resembles the preceding animal. Then in the southwest, in the Desert of Syria and the north of Arabia, is found the hemippus (*Equus hemippus* or *E. hemionus Syriacus*), with shorter ears and more elegant forms than the preceding animals. Prof. Henri Milne-Edwards was of the opinion that the three races of hemione were only local varieties of a single species (*Equus hemionus*).

North of the central plateau of Asia, the steppes of Turkistan are prolonged so as to form the Desert of Gobi, and again farther east into the Desert of Dzungaria. This region, situated immediately south of Siberia, from which it is separated by the valley of the Amoor, and north of the Thian-Shan Mountains, which separate it from China, remained almost entirely unexplored till the time when it passed from the dominion of the Chinese to that of the Russians. In this desert region the celebrated traveler Prejevalski discovered in 1881, during his last journey into central Asia, a wild horse distinct both from the tarpan and from the different varieties of the hemione.

The wild horses of this species, called *kertag* by the Kirghiz and *takki* by the Mongols, live in small herds of from five to fifteen individuals, under the direction of an old stallion. They are very suspicious, and rarely allow themselves to be approached within gunshot. They are extremely swift and easily escape the best-mounted hunters. After several fruitless pursuits, Prejevalski succeeded in bringing down a three-year-old stallion, whose remains are now to be seen in the Museum of the Academy of Sciences of St. Petersburg, and which is the type of the *Equus Prejevalskii* of the naturalist Poliakoff.

The wild horse of Dzungaria is an animal the size of the hemione and more robust in its proportions, in which it resembles the pony. Its head is large, with ears smaller than those of the hemione, the shoulders thick, especially in the male, the limbs robust and stubbier than those of the hemiones and the asses. The mane is short and straight, and the moderately long tail is terminated by a tuft of long hairs in much more abundant supply than in the tail of the hemiones. It has warts on the hind-legs as well as on the fore-legs—a peculiarity of the horse, distinguishing it from the other species of the genus, which have warts only on the fore-legs. The hoofs are full like those of the horse, and not compressed as in the other species; and the lower parts of the legs are furnished with long hairs falling to the crown of the hoof, a feature which the hemiones lack. Like-

wise characteristic is the color of the pelage, a pale gray, almost white, passing into dun on the head and neck, and blending insensibly on the flanks with the pure white of the belly and limbs. The mane, the brush of the tail, and the long hairs of the lower legs and hoofs, are black. There is no trace of the dark dorsal stripe running from the mane to the tail which is characteristic of the hemione. The hairy covering is long and undulating, especially in the rigorous winter of that northern region.

The external appearance of the animal, as may be inferred from our drawing (Fig. 1), is very like that of the small horse or

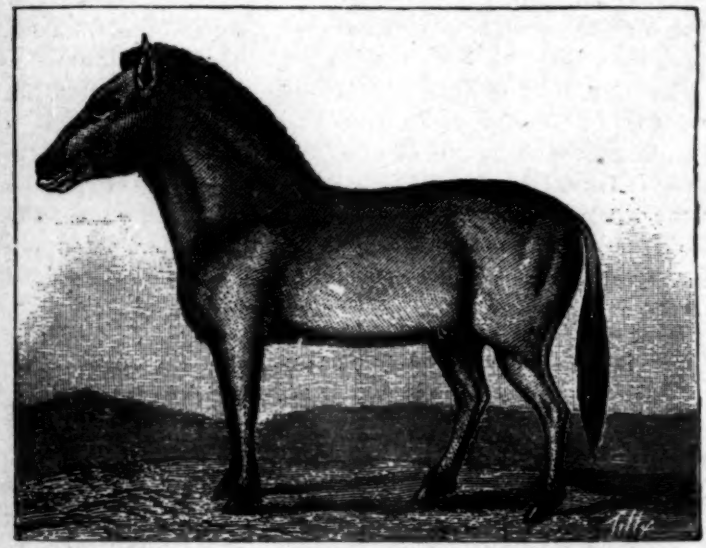

FIG. 1.—DZUNGARIAN WILD HORSE (*Equus Prejevalskii*).

pony. It has been assumed, principally on the ground of the form of the tail, that Prejevalski's horse is a hemione. This opinion does not appear to us tenable; it is evidently founded on a begging of the question, because we have so far been ignorant of the real form of the tail of the primitive horse. The study of other wild species of the genus seems to indicate, on the other hand, that the brush form is characteristic of all the wild horses, the plumy tail and mane being acquisitions of domesticity, like the drooping ears of dogs, pigs, and goats. The tail of Prejevalski's horse is, moreover, more brushy than that of the hemiones. Proofs of another kind are derived from paleontology. There are among the representations of *Equidæ* of the Quaternary epoch, engraved by primitive men on reindeer-horn and ivory, discovered by M. Piette in the caves of the south of France, some very clearly representing a horse with a brush tail and short ears like those of the Prejevalski horse.

Furthermore, the light-colored and uniform coating, without the dorsal stripe and not separated by a darker tint from the white of the lower parts; the plump shape of the hoofs, and the long hairs of the lower legs, are so many characteristics separating the Prejevalski horse from the hemiones and allying it with the horse.*

It is therefore reasonable to assume, with Poliakoff, that the wild horse of Dzungaria is the true primitive horse, and represents the original stock of all the domestic races. That naturalist has compared the skull of this horse with those of the remains of horses in the European Quaternary, and has been led to believe in as complete an identity as possible between the two types. We know, from the researches of Nehring on the Quaternary fauna

FIG. 2.—SYRIAN HEMIPPUS (*Equus hemippus*).

of central Europe, that the existing fauna of the Asiatic steppes, which is characterized by the presence of the saïga, the jerboa, and the souslik, extended into Germany and the north of France. Two species of *Equidæ* form a part of this fauna—the hemione (*Equus hemionus*) and the wild horse (*Equus caballus ferus*), which is probably identical with *Equus Prejevalskii*.

The wild horse of Dzungaria is, of all the species of the genus, the one of most northern habitat. This fact explains why the domestic horse supports so well the winters of northern Europe,

* According to Herodotus, there were in his time wild horses in Scythia, on the banks of the Hypanis, which were white, like Prejevalski's horse. The Asiatic tarpans are never of as clear a color.

while the ass is hard to raise in the north of France, and can not live in Sweden. Furthermore, wild horses were still living, in the sixteenth century, in the Vosges Mountains, as was said by Elisée Roesslin, of Haguenau, in a book published at Strasburg in 1593: "Among the animals that are met in the Vosges, first to be noticed, which would be a marvel in many countries, are the wild horses. They keep in the forests and the mountains, providing their own support, and breeding and increasing at all seasons. In winter they hunt for a shelter under the rocks, feeding, like large game, on the brooms, heaths, and branches of trees. They are wilder and more savage than are the deer of many countries, and as hard to capture as they. Men become masters of them, as with the deer, by the aid of the lakes. When they have succeeded in taming and subduing them—a long and difficult task—they have horses of the best quality. These horses withstand the severest cold and are satisfied with the coarsest food. Their walk is sure, their footing firm and solid, because they are accustomed, like the chamois, to run over the mountains and leap the rocks. If the Vosges support wild horses, while the Black Forest has no such animals, they owe the privilege to their northern exposure, their sterility, and the prevalence of fierce north winds." Wild horses existed at the same time in the Swiss Alps and in Prussia (Erasmus Stella, 1518), and their flesh was eaten as in the Quaternary epoch. Unfortunately, no description or picture of these animals is left us; and although Bishop Fortunat speaks of them as onagras, he was most probably speaking of horses that had become wild—the tarpans—and not real wild horses like *Equus Prejevalskii*.

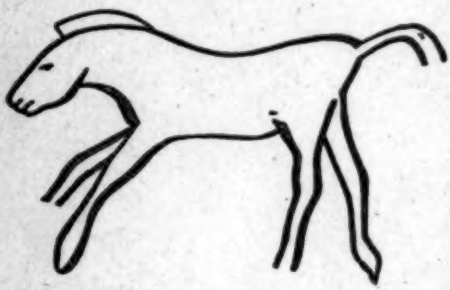

FIG. 3.—FAC-SIMILE OF AN ENGRAVING ON BONE, REPRESENTING A HORSE WITH A BRUSH TAIL AND ERECT MANE. (Cave of Lorthet-Fouilles, by M. Piette.)

The engraving we give of the Prejevalski horse was made from the type of the species in the Museum of the Academy of Sciences of St. Petersburg, and has been obtained from Prof. Eugen Buchner, director of the museum. It is a reproduction of the figure accompanying Poliakoff's memoir in the publications of the Russian Imperial Geographical Society.

We also give, for comparison, the figure (2) of a species of hemione, the Syrian hemippus (*Equus hemippus*), purposely chosen because it is the species most like the horse in its elegant form and the small size of its ears. This picture is an exact copy of a

vellum in the museum, painted from life by M. Bocourt, and represents one of two individuals brought from Damascus in 1855, by M. Bourgoing, which lived for some time at the menagerie of the Paris Museum.—*Translated for the Popular Science Monthly from La Nature.*

THE LIGHTS OF THE CHURCH AND THE LIGHT OF SCIENCE.

By Prof. T. H. HUXLEY, F.R.S.

THERE are three ways of regarding any account of past occurrences, whether delivered to us orally or recorded in writing.

The narrative may be exactly true. That is to say, the words taken in their natural sense, and interpreted according to the rules of grammar, may convey to the mind of the hearer, or of the reader, an idea precisely correspondent with one which would have remained in the mind of a witness. For example, the statement that King Charles I was beheaded at Whitehall on the 30th day of January, 1649, is as exactly true as any proposition in mathematics or physics; no one doubts that any person of sound faculties, properly placed, who was present at Whitehall throughout that day, and who used his eyes, would have seen the king's head cut off; and that there would have remained in his mind an idea of that occurrence which he would have put into words of the same value as those which we use to express it.

Or the narrative may be partly true and partly false. Thus, some histories of the time tell us what the king said, and what Bishop Juxon said; or report royalist conspiracies to effect a rescue; or detail the motives which induced the chiefs of the Commonwealth to resolve that the king should die. One account declares that the king knelt at a high block, another that he lay down with his neck on a mere plank. And there are contemporary pictorial representations of both these modes of procedure. Such narratives, while veracious as to the main event, may and do exhibit various degrees of unconscious and conscious misrepresentation, suppression, and invention, till they become hardly distinguishable from pure fictions. Thus, they present a transition to narratives of a third class, in which the fictitious element predominates. Here, again, there are all imaginable gradations, from such works as Defoe's *quasi*-historical account of the plague year, which probably gives a truer conception of that dreadful time than any authentic history, through the historical novel, drama, and epic, to the purely phantasmal creations of imagina-

tive genius, such as the old Arabian Nights or the modern Shaving of Shagpat. It is not strictly needful for my present purpose that I should say anything about narratives which are professedly fictitious. Yet it may be well, perhaps, if I disclaim any intention of derogating from their value, when I insist upon the paramount necessity of recollecting that there is no sort of relation between the ethical, or the æsthetic, or even the scientific importance of such works, and their worth as historical documents. Unquestionably, to the poetic artist, or even to the student of psychology, Hamlet and Macbeth may be better instructors than all the books of a wilderness of professors of æsthetics or moral philosophy. But, as evidence of occurrences in Denmark, or in Scotland, at the times and places indicated, they are out of court; the profoundest admiration for them, the deepest gratitude for their influence, are consistent with the knowledge that, historically speaking, they are worthless fables, in which any foundation of reality that may exist is submerged beneath the imaginative superstructure.

At present, however, I am not concerned to dwell upon the importance of fictitious literature and the immensity of the work which it has effected in the education of the human race. I propose to deal with the much more limited inquiry, Are there two other classes of consecutive narratives (as distinct from statements of individual facts), or only one? Is there any known historical work which is throughout exactly true, or is there not? In the case of the great majority of histories the answer is not doubtful: they are all only partially true. Even those venerable works which bear the names of some of the greatest of ancient Greek and Roman writers, and which have been accepted by generation after generation, down to modern times, as stores of unquestionable truth, have been compelled by scientific criticism, after a long battle, to descend to the common level, and to confess to a large admixture of error. I might fairly take this for granted; but it may be well that I should intrench myself behind the very apposite words of a historical authority who is certainly not obnoxious to even a suspicion of skeptical tendencies:

> Time was—and that not very long ago—when all the relations of ancient authors concerning the old world were received with a ready belief; and an unreasoning and uncritical faith accepted with equal satisfaction the narrative of the campaigns of Cæsar and of the doings of Romulus, the account of Alexander's marches and of the conquests of Semiramis. We can most of us remember when, in this country, the whole story of regal Rome, and even the legend of the Trojan settlement in Latium, were seriously placed before boys as history and discoursed of as unhesitatingly and in as dogmatic a tone as the tale of the Catiline conspiracy or the conquest of Britain. . . .
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> But all this is now changed. The last century has seen the birth and growth

of a new science—the science of Historical Criticism. . . . The whole world of profane history has been revolutionized. . . .*

If these utterances were true when they fell from the lips of a Bampton lecturer in 1859, with how much greater force do they appeal to us now, when the immense labors of the generation now passing away constitute one vast illustration of the power and fruitfulness of scientific methods of investigation in history, no less than in all other departments of knowledge!

At the present time, I suppose, there is no one who doubts that histories which appertain to any other people than the Jews, and their spiritual progeny in the first century, fall within the second class of the three enumerated. Like Goethe's Autobiography, they might all be entitled Wahrheit und Dichtung—Truth and Fiction. The proportion of the two constituents changes indefinitely; and the quality of the fiction varies through the whole gamut of unveracity. But "Dichtung" is always there. For the most acute and learned of historians can not remedy the imperfections of his sources of information; nor can the most impartial wholly escape the influence of the "personal equation" generated by his temperament and by his education. Therefore, from the narratives of Herodotus to those set forth in yesterday's Times, all history is to be read subject to the warning that fiction has its share therein. The modern vast development of fugitive literature can not be the unmitigated evil that some do vainly say it is, since it has put an end to the popular delusion of less press-ridden times, that what appears in print must be true. We should rather hope that some beneficent influence may create among the erudite a like healthy suspicion of manuscripts and inscriptions, however ancient; for a bulletin may lie, even though it be written in cuneiform characters. Hotspur's starling, that was to be taught to speak nothing but "Mortimer" into the ears of King Henry IV, might be a useful inmate of every historian's library, if "Fiction" were substituted for the name of Harry Percy's friend.

But it was the chief object of the lecturer to the congregation gathered in St. Mary's, Oxford, thirty-one years ago, to prove to them, by evidence gathered with no little labor and marshaled with much skill, that one group of historical works was exempt from the general rule; and that the narratives contained in the canonical Scriptures are free from any admixture of error. With justice and candor, the lecturer impresses upon his hearers that the special distinction of Christianity, among the religions of the world, lies in its claim to be historical; to be surely founded upon

* Bampton Lectures (1859), on The Historical Evidences of the Truth of the Scripture Records stated anew, with Special Reference to the Doubts and Discoveries of Modern Times, by the Rev. G. Rawlinson, M. A., pp. 5, 6.

events which have happened, exactly as they are declared to have happened in its sacred books; which are true, that is, in the sense that the statement about the execution of Charles I is true. Further, it is affirmed that the New Testament presupposes the historical exactness of the Old Testament; that the points of contact of "sacred" and "profane" history are innumerable; and that the demonstration of the falsity of the Hebrew records, especially in regard to those narratives which are assumed to be true in the New Testament, would be fatal to Christian theology.

My utmost ingenuity does not enable me to discover a flaw in the argument thus briefly summarized. I am fairly at a loss to comprehend how any one, for a moment, can doubt that Christian theology must stand or fall with the historical trustworthiness of the Jewish Scriptures. The very conception of the Messiah, or Christ, is inextricably interwoven with Jewish history; the identification of Jesus of Nazareth with that Messiah rests upon the interpretation of passages of the Hebrew Scriptures which have no evidential value unless they possess the historical character assigned to them. If the covenant with Abraham was not made; if circumcision and sacrifices were not ordained by Jahveh; if the "ten words" were not written by God's hand on the stone tables; if Abraham is more or less a mythical hero, such as Theseus; the story of the deluge a fiction; that of the fall a legend; and that of the creation the dream of a seer; if all these definite and detailed narratives of apparently real events have no more value as history than have the stories of the regal period of Rome—what is to be said about the Messianic doctrine, which is so much less clearly enunciated? And what about the authority of the writers of the books of the New Testament, who, on this theory, have not merely accepted flimsy fictions for solid truths, but have built the very foundations of Christian dogma upon legendary quicksands?

But these may be said to be merely the carpings of that carnal reason which the profane call common sense; I hasten, therefore, to bring up the forces of unimpeachable ecclesiastical authority in support of my position. In a sermon preached last December, in St. Paul's Cathedral,* Canon Liddon declares:

> For Christians it will be enough to know that our Lord Jesus Christ set the seal of his infallible sanction on the whole of the Old Testament. He found the Hebrew canon as we have it in our hands to-day, and he treated it as an authority which was above discussion. Nay, more: he went out of his way—if we may reverently speak thus—to sanction not a few portions of it which modern skepticism rejects. When he would warn his hearers against the dangers of spiritual

* The Worth of the Old Testament, a Sermon preached in St. Paul's Cathedral on the Second Sunday in Advent, December. 8, 1889, by H. P. Liddon, D. D., D. C. L., Canon and Chancellor of St. Paul's. Second edition, revised and with a new preface, 1890.

relapse, he bids them remember "Lot's wife."* When he would point out how worldly engagements may blind the soul to a coming judgment, he reminds them how men ate, and drank, and married, and were given in marriage, until the day that Noah entered into the ark, and the flood came and destroyed them all.† If he would put his finger on a fact in past Jewish history which, by its admitted reality, would warrant belief in his own coming resurrection, he points to Jonah's being three days and three nights in the whale's belly (p. 28).‡

The preacher proceeds to brush aside the common—I had almost said vulgar—apologetic pretext that Jesus was using *ad hominem* arguments, or "accommodating" his better knowledge to popular ignorance, as well as to point out the inadmissibility of the other alternative, that he shared the popular ignorance. And to those who hold the latter view sarcasm is dealt out with no niggard hand:

> But they will find it difficult to persuade mankind that, if he could be mistaken on a matter of such strictly religious importance as the value of the sacred literature of his countrymen, he can be safely trusted about anything else. The trustworthiness of the Old Testament is, in fact, inseparable from the trustworthiness of our Lord Jesus Christ; and if we believe that he is the true Light of the world, we shall close our ears against suggestions impairing the credit of those Jewish Scriptures which have received the stamp of his divine authority (p. 25).

Moreover, I learn from the public journals that a brilliant and sharply-cut view of orthodoxy, of like hue and pattern, was only the other day exhibited in that great theological kaleidoscope, the pulpit of St. Mary's, recalling the time so long passed by, when a Bampton lecturer, in the same place, performed the unusual feat of leaving the faith of old-fashioned Christians undisturbed.

Yet many things have happened in the intervening thirty-one years. The Bampton lecturer of 1859 had to grapple only with the infant Hercules of historical criticism; and he is now a full-grown athlete, bearing on his shoulders the spoils of all the lions that have stood in his path. Surely a martyr's courage, as well as a martyr's faith, is needed by any one who, at this time, is prepared to stand by the following plea for the veracity of the Pentateuch:

> Adam, according to the Hebrew original, was for two hundred and forty-three years contemporary with Methuselah, who conversed for a hundred years with Shem. Shem was for fifty years contemporary with Jacob, who probably saw Jochebed, Moses's mother. Thus Moses might, by oral tradition, have obtained the history of Abraham, and even of the deluge, at third hand; and that of the temptation and the fall at fifth hand. . . .
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> If it be granted—as it seems to be—that the great and stirring events in a nation's life will, under ordinary circumstances, be remembered (apart from all written memorials) for the space of one hundred and fifty years, being handed down through five generations, it must be allowed (even on mere human grounds)

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* St. Luke, xvii, 32. † Ibid., 27. ‡ St. Matt. xii, 40.

that the account which Moses gives of the temptation and the fall is to be depended upon, if it passed through no more than four hands between him and Adam.*

If "the trustworthiness of our Lord Jesus Christ" is to stand or fall with the belief in the sudden transmutation of the chemical components of a woman's body into sodium chloride, or on the "admitted reality" of Jonah's ejection, safe and sound, on the shores of the Levant, after three days' sea-journey in the stomach of a gigantic marine animal, what possible pretext can there be for even hinting a doubt as to the precise truth of the longevity attributed to the patriarchs? Who that has swallowed the camel of Jonah's journey will be guilty of the affectation of straining at such a historical gnat—nay, midge—as the supposition that the mother of Moses was told the story of the flood by Jacob; who had it straight from Shem; who was on friendly terms with Methuselah; who knew Adam quite well?

Yet, by the strange irony of things, the illustrious brother of the divine who propounded this remarkable theory has been the guide and foremost worker of that band of investigators of the records of Assyria and of Babylonia who have opened to our view, not merely a new chapter, but a new volume of primeval history, relating to the very people who have the most numerous points of contact with the life of the ancient Hebrews. Now, whatever imperfections may yet obscure the full value of the Mesopotamian records, everything that has been clearly ascertained tends to the conclusion that the assignment of no more than four thousand years to the period between the time of the origin of mankind and that of Augustus Cæsar is wholly inadmissible. Therefore, that biblical chronology, which Canon Rawlinson trusted so implicitly in 1859, is relegated by all serious critics to the domain of fable.

But if scientific method, operating in the region of history, of philology, of archæology, in the course of the last thirty or forty years, has become thus formidable to the theological dogmatist, what may not be said about scientific method working in the province of physical science? For, if it be true that the canonical Scriptures have innumerable points of contact with civil history, it is no less true that they have almost as many with natural history; and their accuracy is put to the test as severely by the latter as by the former. The origin of the present state of the heavens and the earth is a problem which lies strictly within the province of physical science; so is that of the origin of man among living things; so is that of the physical changes which the earth has undergone since the origin of man; so is that of the origin of the various races and nations of men, with all their varieties of lan-

* Bampton Lectures, 1859, pp. 50, 51.

guage and physical conformation. Whether the earth moves round the sun or the contrary; whether the bodily and mental diseases of men and animals are caused by evil spirits or not; whether there is such an agency as witchcraft or not—all these are purely scientific questions; and to all of them the canonical Scriptures profess to give true answers. And though nothing is more common than the assumption* that these books come into conflict only with the speculative part of modern physical science, no assumption can have less foundation.

The antagonism between natural knowledge and the Pentateuch would be as great if the speculations of our time had never been heard of. It arises out of contradiction upon matters of fact. The books of ecclesiastical authority declare that certain events happened in a certain fashion; the books of scientific authority say they did not. As it seems that this unquestionable truth has not yet penetrated among many of those who speak and write on these subjects, it may be useful to give a full illustration of it. And for that purpose I propose to deal, at some length, with the narrative of the Noachian Deluge given in Genesis.

The Bampton lecturer, in 1859, and the Canon of St. Paul's, in 1890, are in full agreement that this history is true, in the sense in which I have defined historical truth. The former is of opinion that the account attributed to Berosus records a tradition—

> not drawn from the Hebrew record, much less the foundation of that record; yet coinciding with it in the most remarkable way. The Babylonian version is tricked out with a few extravagances, as the monstrous size of the vessel and the translation of Xisuthros; but otherwise it is the Hebrew history *down to its minutiæ* (p. 64).

Moreover, correcting Niebuhr, the Bampton lecturer points out that the narrative of Berosus distinctly implies the universality of the flood:

> It is plain that the waters are represented as prevailing above the tops of the loftiest mountains in Armenia—a height which must have been seen to involve the submersion of all the countries with which the Babylonians were acquainted (p. 66).

I may remark, in passing, that many people think the size of Noah's ark "monstrous," considering the probable state of the art of ship-building only sixteen hundred years after the origin of man; while others are so unreasonable as to inquire why the translation of Enoch is less an extravagance than that of Xisuthros. It is more important, however, to note that the universality of the deluge is recognized, not merely as a part of the

* For example, it appears to me to pervade and vitiate Mr. Wilfrid Ward's argument in the last number of this review.

story, but as a necessary consequence of some of its details. The latest exponent of Anglican orthodoxy, as we have seen, insists upon the accuracy of the Pentateuchal history of the flood in a still more forcible manner. It is cited as one of those very narratives to which the authority of the Founder of Christianity is pledged, and upon the accuracy of which "the trustworthiness of our Lord Jesus Christ" is staked, just as others have staked it upon the truth of the histories of demoniac possession in the Gospels.

Now, when those who put their trust in scientific methods of ascertaining the truth in the province of natural history find themselves confronted and opposed on their own ground by ecclesiastical pretensions to better knowledge, it is, undoubtedly, most desirable for them to make sure that their conclusions, whatever they may be, are well founded. And, if they put aside the unauthorized interference with their business and relegate the Pentateuchal history to the region of pure fiction, they are bound to assure themselves that they do so because the plainest teachings of nature (apart from all doubtful speculations) are irreconcilable with the assertions which they reject.

At the present time it is difficult to persuade serious scientific inquirers to occupy themselves, in any way, with the Noachian Deluge. They look at you with a smile and a shrug, and say they have more important matters to attend to than mere antiquarianism. But it was not so in my youth. At that time, geologists and biologists could hardly follow to the end any path of inquiry without finding the way blocked by Noah and his ark, or by the first chapter of Genesis; and it was a serious matter, in this country at any rate, for a man to be suspected of doubting the literal truth of the diluvial or any other Pentateuchal history. The fiftieth anniversary of the foundation of the Geological Club in 1825 was, if I remember rightly, the last occasion on which the late Sir Charles Lyell spoke to even so small a public as the members of that body. Our veteran leader lighted up once more, and, referring to the difficulties which beset his early efforts to create a rational science of geology, spoke with his wonted clearness and vigor of the social ostracism which pursued him after the publication of the Principles of Geology, in 1830, on account of the obvious tendency of that noble work to discredit the Pentateuchal accounts of the creation and the deluge. If my younger contemporaries find this hard to believe, I may refer them to a grave book, On the Doctrine of the Deluge, published eight years later, and dedicated by its author to his father, the then Archbishop of York. The first chapter refers to the treatment of the Mosaic Deluge, by Dr. Buckland and Mr. Lyell, in the following terms:

Their respect for revealed religion has prevented them from arraying themselves openly against the scriptural account of it—much less do they deny its truth—but they are in a great hurry to escape from the consideration of it, and evidently concur in the opinion of Linnæus, that no proofs whatever of the deluge are to be discovered in the structure of the earth (p. 1).

And after an attempt to reply to some of Lyell's arguments, which it would be cruel to reproduce, the writer continues:

When, therefore, upon such slender grounds, it is determined, in answer to those who insist upon its universality, that the Mosaic Deluge must be considered a preternatural event, far beyond the reach of philosophical inquiry; not only as to the causes employed to produce it, but also as to the effects most likely to result from it; that determination wears an aspect of skepticism, which, however much soever it may be unintentional in the mind of the writer, yet can not but produce an evil impression on those who are already predisposed to carp and cavil at the evidences of revelation (pp. 8, 9).

The kindly and courteous writer of these curious passages is evidently unwilling to make the geologists the victims of general opprobrium by pressing the obvious consequences of their teaching home. One is, therefore, pained to think of the feelings with which, if he lived so long as to become acquainted with the Dictionary of the Bible, he must have perused the article Noah, written by a dignitary of the Church for that standard compendium and published in 1863. For the doctrine of the universality of the deluge is therein altogether given up; and I permit myself to hope that a long criticism of the story from the point of view of natural science, with which, at the request of the learned theologian who wrote it, I supplied him, may have in some degree contributed toward this happy result.

Notwithstanding diligent search, I have been unable to discover that the universality of the deluge has any defender left, at least among those who have so far mastered the rudiments of natural knowledge as to be able to appreciate the weight of evidence against it. For example, when I turned to the Speaker's Bible, published under the sanction of high Anglican authority, I found the following judicial and judicious deliverance, the skillful wording of which may adorn, but does not hide, the completeness of the surrender of the old teaching:

Without pronouncing too hastily on any fair inferences from the words of Scripture, we may reasonably say that their most natural interpretation is that the whole race of man had become grievously corrupted since the faithful had intermingled with the ungodly; that the inhabited world was consequently filled with violence, and that God had decreed to destroy all mankind except one single family; that, therefore, all that portion of the earth, perhaps as yet a very small portion, into which mankind had spread was overwhelmed by water. The ark was ordained to save one faithful family; and lest that family, on the subsidence of the waters, should find the whole country round them a desert, a pair of all the

beasts of the land and of the fowls of the air were preserved along with them, and along with them went forth to replenish the now desolated continent. The words of Scripture (confirmed as they are by universal tradition) appear at least to mean as much as this. They do not necessarily mean more.*

In the third edition of Kitto's Cyclopædia of Bibical Literature (1876), the article Deluge, written by my friend the present distinguished head of the Geological Survey of Great Britain, extinguishes the universality doctrine as thoroughly as might be expected from its authorship; and, since the writer of the article Noah refers his readers to that entitled Deluge, it is to be supposed, notwithstanding his generally orthodox tone, that he does not dissent from its conclusions. Again, the writers in Herzog's Real-Encyclopädie (Bd. X, 1882) and in Riehm's Handwörterbuch (1884)—both works with a conservative leaning—are on the same side; and Diestel,† in his full discussion of the subject, remorselessly rejects the universality doctrine. Even that stanch opponent of scientific rationalism—may I say rationality?—Zöckler,‡ flinches from a distinct defense of the thesis, any opposition to which, well within my recollection, was howled down by the orthodox as mere "infidelity." All that, in his sore straits, Dr. Zöckler is able to do, is to pronounce a faint commendation upon a particularly absurd attempt at reconciliation, which would make out the Noachian Deluge to be a catastrophe which occurred at the end of the Glacial epoch. This hypothesis involves only the trifle of a physical revolution of which geology knows nothing; and which, if it secured the accuracy of the Pentateuchal writer about the fact of the deluge, would leave the details of his account as irreconciliable with the truths of elementary physical science as ever. Thus I may be permitted to spare myself and my readers the weariness of a recapitulation of the overwhelming arguments against the universality of the deluge, which they will now find for themselves stated, as fully and forcibly as could be wished, by Anglican and other theologians, whose orthodoxy and conservative tendencies have, hitherto, been above suspicion. Yet many fully admit (and, indeed, nothing can be plainer) that the Pentateuchal narrator means to convey that, as a matter of fact, the whole earth known to him was inundated; nor is it less obvious that unless all mankind, with the exception of Noah and his family, were actually destroyed, the references to the flood in the New Testament are unintelligible.

But I am quite aware that the strength of the demonstration that no universal deluge ever took place has produced a change of front in the army of apologetic writers. They have imagined that

* Commentary on Genesis, by the Bishop of Ely, p. 77.

† Die Sintflut, 1876.

‡ Theologie und Naturwissenschaft, ii, 784–791 (1877).

the substitution of the adjective partial for universal will save the credit of the Pentateuch, and permit them, after all, without too many blushes, to declare that the progress of modern science only strengthens the authority of Moses. Nowhere have I found the case of the advocates of this method of escaping from the difficulties of the actual position better put than in the lecture of Prof. Diestel to which I have referred. After frankly admitting that the old doctrine of universality involves physical impossibilities, he continues:

> All these difficulties fall away as soon as we give up the universality of the deluge, and imagine a *partial* flooding of the earth, say in western Asia. But have we a right to do so? The narrative speaks of "the whole earth." But what is the meaning of this expression? Surely not the whole surface of the earth according to the ideas of *modern* geographers, but, at most, according to the conceptions of the biblical author. This very simple conclusion, however, is never drawn by too many readers of the Bible. But one need only cast one's eyes over the tenth chapter of Genesis in order to become acquainted with the geographical horizon of the Jews. In the north it was bounded by the Black Sea and the mountains of Armenia; extended toward the east very little beyond the Tigris; hardly reached the apex of the Persian Gulf; passed, then, through the middle of Arabia and the Red Sea; went southward through Abyssinia, and then turned westward by the frontiers of Egypt, and inclosed the easternmost islands of the Mediterranean (p. 11).

The justice of this observation must be admitted, no less than the further remark that, in still earlier times, the pastoral Hebrews very probably had yet more restricted notions of what constituted "the whole earth." Moreover, I, for one, fully agree with Prof. Diestel that the motive, or generative incident, of the whole story is to be sought in the occasionally excessive and desolating floods of the Euphrates and Tigris.

Let us, provisionally, accept the theory of a partial deluge, and try to form a clear mental picture of the occurrence. Let us suppose that, for forty days and forty nights, such a vast quantity of water was poured upon the ground that the whole surface of Mesopotamia was covered by water to a depth certainly greater, probably much greater, than fifteen cubits, or twenty feet (Gen. vii, 20). The inundation prevails upon the earth for one hundred and fifty days; and then the flood gradually decreases, until, on the seventeenth day of the seventh month the ark, which had previously floated on its surface, grounds upon the "mountains of Ararat"* (Gen. viii, 34). Then, as Diestel has acutely pointed out (Sintflut, p. 13), we are to imagine the further subsidence of the flood to take place so gradually that it was not until nearly two months and a half after this time (that is to say,

* It is very doubtful if this means the region of the Armenian Ararat. More probably it designates some part, either of the Kurdish range or of its southeastern continuation.

on the first day of the tenth month) that the "tops of the mountains" became visible. Hence it follows that, if the ark drew even as much as twenty feet of water, the level of the inundation fell very slowly—at a rate of only a few inches a day—until the top of the mountain on which it rested became visible. This is an amount of movement which, if it took place in the sea, would be overlooked by ordinary people on the shore. But the Mesopotamian plain slopes gently, from an elevation of five hundred or six hundred feet at its northern end, to the sea, at its southern end, with hardly so much as a notable ridge to break its uniform flatness, for three hundred to four hundred miles. These being the conditions of the case, the following inquiry naturally presents itself: not, be it observed, as a recondite problem, generated by modern speculation, but as a plain suggestion flowing out of that very ordinary and archaic piece of knowledge that water can not be piled up in a heap like sand; or that it seeks the lowest level. When, after one hundred and fifty days, "the fountains also of the deep and the windows of heaven were stopped, and the rain from heaven was restrained" (Gen. viii, 2), what prevented the mass of water, several, possibly very many, fathoms deep, which covered, say, the present site of Bagdad, from sweeping seaward in a furious torrent; and, in a very few hours, leaving, not only the "tops of the mountains," but the whole plain, save any minor depressions, bare? How could its subsidence, by any possibility, be an affair of weeks and months?

And if this difficulty is not enough, let any one try to imagine how a mass of water several, perhaps very many, fathoms deep, could be accumulated on a flat surface of land rising well above the sea, and separated from it by no sort of barrier. Most people know Lord's Cricket-ground. Would it not be in absurd contradiction to our common knowledge of the properties of water to imagine that, if all the mains of all the water-works of London were turned on to it, they could maintain a heap of water twenty feet deep over its level surface? Is it not obvious that the water, whatever momentary accumulation might take place at first, would not stop there, but that it would dash, like a mighty mill-race, southward down the gentle slope which ends in the Thames? And is it not further obvious, that whatever depth of water might be maintained over the cricket-ground, so long as all the mains poured on to it, anything which floated there would be speedily whirled away by the current, like a cork in a gutter when the rain pours? But if this is so, then it is no less certain that Noah's deeply laden, sailless, oarless, and rudderless craft, if by good fortune it escaped capsizing in whirlpools, or having its bottom knocked into holes by snags (like those which prove fatal even to well-built steamers on the Mississippi in our day), would have

speedily found itself a good way down the Persian Gulf, and not long after in the Indian Ocean, somewhere between Arabia and Hindostan. Even if, eventually, the ark might have gone ashore, with other jetsam and flotsam, on the coasts of Arabia, or of Hindostan, or of the Maldives, or of Madagascar, its return to the "mountains of Ararat" would have been a miracle more stupendous than all the rest.

Thus, the last state of the would-be reconcilers of the story of the deluge with fact is worse than the first. All that they have done is to transfer the contradictions to established truth from the region of science proper to that of common information and common sense. For, really, the assertion that the surface of a body of deep water, to which no addition was made, and which there was nothing to stop from running into the sea, sank at the rate of only a few inches or even feet a day, simply outrages the most ordinary and familiar teachings of every man's daily experience. A child may see the folly of it.

In addition, I may remark that the necessary assumption of the "partial deluge" hypothesis (if it is confined to Mesopotamia) that the Hebrew writer must have meant low hills when he said "high mountains"—is quite untenable. On the eastern side of the Mesopotamian plain, the snowy peaks of the frontier ranges of Persia are visible from Bagdad,* and even the most ignorant herdsmen in the neighborhood of "Ur of the Chaldees," near its western limit, could hardly have been unacquainted with the comparatively elevated plateau of the Syrian Desert which lay close at hand. But, surely, we must suppose the biblical writer to be acquainted with the highlands of Palestine and with the masses of the Sinaitic Peninsula, which soar more than eight thousand feet above the sea, if he knew of no higher elevations; and, if so, he could not well have meant to refer to mere hillocks when he said that "all the high mountains which were under the whole heaven were covered" (Gen. vii, 19). Even the hill-country of Galilee reaches an elevation of four thousand feet; and a flood which covered it could by no possibility have been other than universal in its superficial extent. Water really can not be got to stand at, say, four thousand feet above the sea-level over Palestine, without covering the rest of the globe to the same height. Even if in the course of Noah's six hundredth year some prodigious convulsion had sunk the whole region inclosed within "the horizon of the geographical knowledge" of the Israelites by that much, and another had pushed it up again, just in time to catch the ark upon "the mountains of Ararat," matters are not much

* So Reclus (Nouvelle Géographie Universelle, ix, 386), but I find the statement doubted by an authority of the first rank.

mended. I am afraid to think of what would have become of a vessel so little seaworthy as the ark and of its very numerous passengers, under the peculiar obstacles to quiet flotation which such rapid movements of depression and upheaval would have generated.

Thus, in view, not, I repeat, of the recondite speculations of infidel philosophers, but in the face of the plainest and most commonplace of ascertained physical facts, the story of the Noachian Deluge has no more claim to credit than has that of Deucalion; and, whether it was or was not suggested by the familiar acquaintance of its originators with the effects of unusually great overflows of the Tigris and Euphrates, it is utterly devoid of historical truth.

That is, in my judgment, the necessary result of the application of criticism, based upon assured physical knowledge, to the story of the deluge. And it is satisfactory that the criticism which is based, not upon literary and historical speculation, but on well-ascertained facts in the departments of literature and of history, tends to exactly the same conclusion.

For I find this much agreed upon by all biblical scholars of repute, that the story of the deluge in Genesis is separable into at least two sets of statements; and that, when the statements thus separated are recombined in their proper order, each set furnishes an account of the event, coherent and complete within itself, but in some respects discordant with that afforded by the other set. This fact, as I understand, is not disputed. Whether one of these is the work of an Elohist and the other of a Jehovist narrator; whether the two have been pieced together in this strange fashion because, in the estimation of the compilers and editors of the Pentateuch, they had equal and independent authority, or not; or whether there is some other way of accounting for it, are questions the answer to which do not affect the fact. If possible, I avoid *a priori* arguments. But still, I think it may be urged, without imprudence, that a narrative having this structure is hardly such as might be expected from a writer possessed of full and infallibly accurate knowledge. Once more, it would seem that it is not necessarily the mere inclination of the skeptical spirit to question everything, or the willful blindness of infidels, which prompts grave doubts as to the value of a narrative thus curiously unlike the ordinary run of veracious histories.

But the voice of archæological and historical criticism still has to be heard; and it gives forth no uncertain sound. The marvelous recovery of the records of an antiquity, far superior to any that can be ascribed to the Pentateuch, which has been effected by the decipherers of cuneiform characters, has put us in posses-

sion of a series, once more, not of speculations, but of facts, which have a most remarkable bearing upon the question of the trustworthiness of the narrative of the flood. It is established that, for centuries before the asserted migration of Terah from Ur of the Chaldees (which, according to the orthodox interpreters of the Pentateuch, took place after the year 2000 B. C.), lower Mesopotamia was the seat of a civilization in which art and science and literature had attained a development formerly unsuspected, or, if there were faint reports of it, treated as fabulous. And it is also no matter of speculation, but a fact, that the libraries of these people contain versions of a long epic poem, one of the twelve books of which tells a story of a deluge which, in a number of its leading features, corresponds with the story attributed to Berosus, no less than with the story given in Genesis, with curious exactness. Thus, the correctness of Canon Rawlinson's conclusion, cited above, that the story of Berosus was neither drawn from the Hebrew record, nor is the foundation of it, can hardly be questioned. It is highly probable, if not certain, that Berosus relied upon one of the versions (for there seem to have been several) of the old Babylonian epos, extant in his time; and if that is a reasonable conclusion, why is it unreasonable to believe that the two stories, which the Hebrew compiler has put together in such inartistic fashion, were ultimately derived from the same source? I say ultimately, because it does not at all follow that the two versions, possibly trimmed by the Jehovistic writer on the one hand, and by the Elohistic on the other, to suit Hebrew requirements, may not have been current among the Israelites for ages. And they may have acquired great authority before they were combined in the Pentateuch.

Looking at the convergence of all these lines of evidence to the one conclusion—that the story of the flood in Genesis is merely a Bowdlerized version of one of the oldest pieces of purely fictitious literature extant; that whether this is or is not its origin, the events asserted in it to have taken place assuredly never did take place; further, that, in point of fact, the story, in the plain and logically necessary sense of its words, has long since been given up by orthodox and conservative commentators of the Established Church—I can but admire the courage and clear foresight of the Anglican divine who tells us that we must be prepared to choose between the trustworthiness of scientific method and the trustworthiness of that which the Church declares to be divine authority. For, to my mind, this declaration of war to the knife against secular science, even in its most elementary forms; this rejection without a moment's hesitation of any and all evidence which conflicts with theological dogma, is the only position which is logically reconcilable with the axioms of orthodoxy. If the

Gospels truly report that which an incarnation of the God of Truth communicated to the world, then it surely is absurd to attend to any other evidence touching matters about which he made any clear statement, or the truth of which is distinctly implied by his words. If the exact historical truth of the gospel is an axiom of Christianity, it is as just and right for a Christian to say, Let us "close our ears against suggestions" of scientific critics, as it is for the man of science to refuse to waste his time upon circle-squarers and flat-earth fanatics.

It is commonly reported that the manifesto by which the Canon of St. Paul's proclaims that he nails the colors of the straitest biblical infallibility to the mast of the ship ecclesiastical, was put forth as a counterblast to Lux Mundi; and that the passages which I have more particularly quoted are directed against the essay on The Holy Spirit and Inspiration in that collection of treatises by Anglican divines of high standing, who must assuredly be acquitted of conscious "infidel" proclivities. I fancy that rumor must, for once, be right, for it is impossible to imagine a more direct and diametrical contradiction than that between the passages from the sermon cited above and those which follow:

> What is questioned is that our Lord's words foreclose certain critical positions as to the character of Old Testament literature. For example, does his use of Jonah's resurrection as a *type* of his own, depend in any real degree upon whether it is historical fact or allegory? . . . Once more, our Lord uses the time before the flood, to illustrate the carelessness of men before his own coming. . . . In referring to the flood he certainly suggests that he is treating it as typical, for he introduces circumstances—"eating and drinking, marrying and giving in marriage"—which have no counterpart in the original narrative (pp. 358, 359).

While insisting on the flow of inspiration through the whole of the Old Testament, the essayist does not admit its universality. Here, also, the new apologetic demands a partial flood:

> But does the inspiration of the recorder guarantee the exact historical truth of what he records? And, in matter of fact, can the record, with due regard to legitimate historical criticism, be pronounced true? Now, to the latter of these two questions (and they are quite distinct questions) we may reply that there is nothing to prevent our believing, as our faith strongly disposes us to believe, that the record from Abraham downward is, in substance, in the strict sense historical (p. 351).

It would appear, therefore, that there is nothing to prevent our believing that the record, from Abraham upward, consists of stories in the strict sense unhistorical, and that the pre-Abrahamic narratives are mere moral and religious "types" and parables.

I confess I soon lose my way when I try to follow those who

walk delicately among "types" and allegories. A certain passion for clearness forces me to ask, bluntly, whether the writer means to say that Jesus did not believe the stories in question, or that he did? When Jesus spoke, as of a matter of fact, that "the flood came and destroyed them all," did he believe that the deluge really took place, or not? It seems to me that, as the narrative mentions Noah's wife, and his sons' wives, there is good scriptural warranty for the statement that the antediluvians married and were given in marriage; and I should have thought that their eating and drinking might be assumed by the firmest believer in the literal truth of the story. Moreover, I venture to ask what sort of value, as an illustration of God's methods of dealing with sin, has an account of an event that has never happened? If no flood swept the careless people away, how is the warning of more worth than the cry of "wolf" when there is no wolf? If Jonah's three days' residence in the whale is not an "admitted reality," how could it "warrant belief" in the "coming resurrection"? If Lot's wife was not turned into a pillar of salt, the bidding those who turn back from the narrow path to "remember" it is, morally, about on a level with telling a naughty child that a bogy is coming to fetch it away. Suppose that a conservative orator warns his hearers to beware of great political and social changes, lest they end, as in France, in the domination of a Robespierre; what becomes, not only of his argument, but of his veracity, if he, personally, does not believe that Robespierre existed and did the deeds attributed to him?

Like all other attempts to reconcile the results of scientifically conducted investigation with the demands of the outworn creeds of ecclesiasticism, the essay on Inspiration is just such a failure as must await mediation, when the mediator is unable properly to appreciate the weight of the evidence for the case of one of the two parties. The question of "inspiration" really possesses no interest for those who have cast ecclesiasticism and all its works aside, and have no faith in any source of truth save that which is reached by the patient application of scientific methods. Theories of inspiration are speculations as to the means by which the authors of statements, in the Bible or elsewhere, have been led to say what they have said—and it assumes that natural agencies are insufficient for the purpose. I prefer to stop short of this problem, finding it more profitable to undertake the inquiry which naturally precedes it—namely, Are these statements true or false? If they are true, it may be worth while to go into the question of their supernatural generation; if they are false, it certainly is not worth mine.

Now, not only do I hold it to be proved that the story of the deluge is a pure fiction; but I have no hesitation in affirming the

same thing of the story of the creation.* Between these two lies the story of the creation of man and woman and their fall from primitive innocence, which is even more monstrously improbable than either of the other two, though, from the nature of the case, it is not so easily capable of direct refutation. It can be demonstrated that the earth took longer than six days in the making, and that the deluge, as described, is a physical impossibility; but there is no proving, especially to those who are perfect in the art of closing their ears to that which they do not wish to hear, that a snake did not speak, or that Eve was not made out of one of Adam's ribs.

The compiler of Genesis, in its present form, evidently had a definite plan in his mind. His countrymen, like all other men, were doubtless curious to know how the world began; how men, and especially wicked men, came into being, and how existing nations and races rose among the descendants of one stock; and, finally, what was the history of their own particular tribe. They, like ourselves, desired to solve the four great problems of cosmogeny, anthropogeny, ethnogeny, and geneogeny. The Pentateuch furnishes the solutions which appeared satisfactory to its author. One of these, as we have seen, was borrowed from a Babylonian fable; and I know of no reason to suspect any different origin from the rest. Now, I would ask, is the story of the fabrication of Eve to be regarded as one of those pre-Abrahamic narratives, the historical truth of which is an open question, in face of the reference to it in a speech unhappily famous for the legal oppression to which it has been wrongfully forced to lend itself?

> Have ye not read, that he which made them from the beginning made them male and female, and said, For this cause shall a man leave his father and mother, and cleave to his wife; and the twain shall become one flesh? (Matthew, xix, 5).

If divine authority is not here claimed for the twenty-fourth verse of the second chapter of Genesis, what is the value of language? And again, I ask, if one may play fast and loose with the story of the fall, as a "type" or "allegory," what becomes of the foundation of Pauline theology?—

> For since by man came death, by man came also the resurrection of the dead.

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* So far as I know, the narrative of the creation is not now held to be true, in the sense in which I have defined historical truth, by any of the reconcilers. As for the attempts to stretch the Pentateuchal days into periods of thousands or millions of years, the verdict of the eminent biblical scholar, Dr. Riehm (Der biblische Schöpfungsbericht, 1881, pp. 15, 16), on such pranks of "Auslegungskunst" should be final. Why do the reconcilers take Goethe's advice seriously?—

> "Im Auslegen seyd frisch und munter!
> Legt ihr's nicht aus, so legt was unter."

For as in Adam all die, so also in Christ shall all be made alive (1 Corinthians, xv, 21, 22).

If Adam may be held to be no more real a personage than Prometheus, and if the story of the fall is merely an instructive "type," comparable to the profound Promethean mythus, what value has Paul's dialectic?

While, therefore, every right-minded man must sympathize with the efforts of those theologians who have not been able altogether to close their ears to the still, small voice of reason, to escape from the fetters which ecclesiasticism has forged, the melancholy fact remains, that the position they have taken up is hopelessly untenable. It is raked alike by the old-fashioned artillery of the churches and by the fatal weapons of precision with which the *enfants perdus* of the advancing forces of science are armed. They must surrender, or fall back into a more sheltered position. And it is possible that they may long find safety in such retreat.

It is, indeed, probable that the proportional number of those who will distinctly profess their belief in the transubstantiation of Lot's wife, and the anticipatory experience of submarine navigation by Jonah; in water standing fathoms deep on the side of a declivity without anything to hold it up; and in devils who enter swine, will not increase. But neither is there ground for much hope that the proportion of those who cast aside these fictions and adopt the consequence of that repudiation, are, for some generations, likely to constitute a majority. Our age is a day of compromises. The present and the near future seem given over to those happily, if curiously, constituted people who see as little difficulty in throwing aside any amount of post-Abrahamic scriptural narrative, as the authors of Lux Mundi see in sacrificing the pre-Abrahamic stories; and, having distilled away every inconvenient matter of fact in Christian history, continue to pay divine honors to the residue. There really seems to be no reason why the next generation should not listen to a Bampton lecture modeled upon that addressed to the last:

Time was—and that not very long ago—when all the relations of biblical authors concerning the old world were received with a ready belief; and an unreasoning and uncritical faith accepted with equal satisfaction the narrative of the captivity and the doings of Moses at the court of Pharaoh, the account of the apostolic meeting in the Epistle to the Galatians, and of the fabrication of Eve. We can most of us remember when, in this country, the whole story of the Exodus, and even the legend of Jonah, were seriously placed before boys as history, and discoursed of in as dogmatic a tone as the tale of Agincourt or the history of the Norman Conquest.

But all this is now changed. The last century has seen the growth of scientific criticism to its full length. The whole world of history has been revolution-

ized, and the mythology which embarrassed earnest Christians has vanished as an evil mist, the lifting of which has only more fully revealed the lineaments of infallible truth. No longer in contact with fact of any kind, faith stands now and forever proudly inaccessible to the attacks of the infidel.

So far the apologist of the future. Why not? *Cantabit vacuus.—Nineteenth Century.*

A LITTLE BOYS' GAME WITH A BALL.

By HENRY J. PHILPOTT.

A YEAR or two ago there went the rounds of the daily papers a few verses intended to express the feelings of an elderly lady from the country when her city folks had taken her to see the national game. It was all very interesting and funny, but may be summed up in her oftenest-repeated couplet:

"Jist a passel o' big men a-playin'
A little boys' game with a ball"—

which was a true bill. But how came these men to be playing this little boys' game? Here steps in the student of sociology, and offers explanations in abundance. The truly great philosopher of this and all generations is the man who for the first time considers unconsidered trifles. Herein lies the greatness of Herbert Spencer.

In this matter we all have a duty which most of us are likely to forget. We should record for the benefit of the coming philosopher, who by the process of evolution is sure to have a finer and more effective brain than ours, certain facts which seem trivial to us, but which may be of transcendent importance to him. What if our predecessors had scrupulously done likewise? How much more satisfactory would have been our nineteenth-century philosophy!

Hit or miss, I propose to describe a few of the ball-plays I learned as pupil and teacher in country schools within twenty miles of the Mississippi River, and about half-way between St. Louis and St. Paul. I shall not be deterred by the reflection that others may be able, if they would, to describe a greater variety of ball-games.

Did you ever stop to think how much of human life there is consumed in games of ball? A marble is a ball. So is a billiard-ball, a croquet-ball. So—did you ever think of it?—are shot and shell, though their elongation in modern military engineering has made war less truly than it used to be

"Jist a passel o' big men a-playin'
A little boys' game with a ball."

Perhaps the first thing that boys in their games ever did with a ball was to hit other boys with it. At any rate, their games in my time have been made of such simple elements as the effort to—

1. Hit somebody. 2. Hit a target. 3. Hit another ball, as in marbles. 4. Catch the ball. 5. Bat the ball. 6. Run to a goal, or out of reach of the ball, before being hit or "crossed out." And, of course— 7. Prevent the enemy from accomplishing any of these things.

Ball-games are products, and pretty good illustrations, of the process of evolution. Hence it is fitting to proceed in their discussion as Nature proceeds in evolution—from the simple to the complex. We can beat Haeckel at this. He can not bridge the gap between life and not-life, but we can go back of all ball-games to a primordial ball-playing which is not a game at all. When a number of boys engage in indiscriminately hitting one another, they often enjoy the excitement, but they are not playing a game. They begin to play a game when they introduce forfeits, or rewards, or both.

The commonest forfeit is that of the right to play—that is, the player who misses is "out" for the remainder of the game or inning. The moment this was introduced, what was called "sock-ball" became a real game. There were no bases, no bats, no anything except a lot of boys, and a ball with which they were trying to hit one another. But if one threw and missed, or his ball was caught, he was out. When all but one, or an agreed number, were out, the game was ended, and a new one was started. Of course, the last boy could not be put out, for there were no players for him to throw at and miss. He won the game, and his reward was the first throw on the new game.

The game of "hole-ball," or "wibble-wobble," retained these features, and added a hole in the ground large enough to nicely hold the ball. The reward of the winner was not the first throw, but the privilege of placing the ball in the hole and naming the first thrower, who had the advantage of a throw before the players had time to scatter—for, of course, they all stood close by the hole until the name was called, each thinking it might be his own. It required considerable alertness to be ready to instantly do either one of two things—seize and throw the ball, or run away. Faculties were called into exercise which, if duly cultivated, help to make success all through life. They are the faculties needed by the general, who may at any moment be forced to fight or forced to retreat. As the game proceeds, the players come back to the hole every time one goes out on a miss or a catch, and the one who is missed or catches the ball puts it in the hole and names the next thrower, and so on until all but one are out. The hole serves constantly as a base of operations, and the player who at

any time is hit, and must therefore try to hit a fellow, may throw from where he finds the ball on the ground, or from any point between there and the hole. That was our rule, at any rate.

The hole was sometimes replaced by the boys' hats, and the owner of the hat into which the ball was dropped was the next thrower. This was called "hat-ball." A new feature was sometimes introduced. A single miss did not put the player out. For each miss he put a chip or pebble into his hat for a counter, called a "pig." When he had accumulated an agreed number of pigs, he was out.

Retaining all these features except the hats, the game of "roll-a-hole" went back to the hole in the ground; but, instead of a single one, there was a row of them—as many as there were players. The ball was rolled along the line of these holes, and would stop in one of them. Thus the thrower was chosen by lot, and not by discrimination; though, of course, this was not always true if the ball-holder was dishonest, and had any desire to discriminate. He was closely watched, and often accused of unfairness. It is ever thus.

I do not recall any other games of this class that we played. The most popular of them was the one called "wibble-wobble" in our school, and "hole-ball" wherever else I have seen it. Hat-ball and roll-a-hole may be higher forms, the latter seeming to me to be the last of its line.

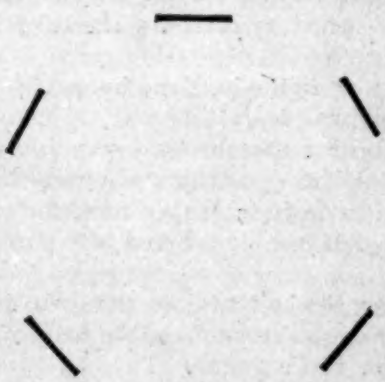
There is an allied line of games which reached a more interesting development. The simplest form of it that I have seen was called "draw-base" by the boy who brought its traditions to our school. Here for the first time the players were divided into two opposing teams, and bases were introduced. These bases were two, facing each other, and the ball was thrown from one base to the other in the effort to hit one of the opposing players, all of whom were standing on the bases. A player who was hit, unless he caught the ball, was not put out, but became an active recruit in the ranks of his late enemies. When one base was in this way emptied of its players, the game was over. Played with a common ball, this game was voted extremely stupid, and was rarely indulged in. But with snow-balls it formed a large part of the winter's sport. Played with a number of balls, inside a high inclosure, so that the balls would not have to be chased, it might be made quite exciting.

Sometimes the two bases were on opposite sides of the school-house, over which the ball had to be thrown to and fro until caught, before anybody could be hit with it. Whenever it was caught, the two teams changed sides of the school-house, and it was while this exchange was going on that the hitting had to be done. A player could not be hit after he reached "home." As in

"draw-base," the game kept on until one team swallowed up the other. I always heard this game called "ante-over." It was usually played by the small boys and the girls, the latter catching the ball in their aprons. The point was to get around the house and hit some of the other side before they knew the ball had been caught. The bulls and bears of Wall Street make a similar use of monopolized information.

Retaining the bases, and the division into teams or sides, the game of "bull-pen" went away beyond the last two in complexity and interest. It was one of our great games, and the largest boys delighted in it. It furnishes us a step in evolution which we can partly illustrate by a diagram. In the games of draw-base and ante-over there are two parallel bases, thus:

The players all stand on bases, and they all stand on an equality. There is no specialization of duties or privileges. In bull-pen the two bases are subdivided into half as many as there are players, and they are arranged into the circumference of a ring, as shown below.



One player stands on each base. These are the winners of the last preceding game—the "ins." The bases are positions of honor. The outs are a disorganized rabble, roaming about inside the ring. Here is differentiation as well as division. Here is a plain case of evolution.

As in ante-over, the ball must be caught by some player before he can hit anybody with it—unless he has just been hit himself. In fact, it is not "hot" at the beginning of the game until it has passed three times around the bases and been caught each time at every base. After that, any baseman who catches it may throw at anybody inside the ring, who, if hit, must get the ball, and, without going outside the ring, must try to hit some baseman. The basemen have the privilege of running as far away as they please in order to avoid being hit.

In one respect the two sides stand on an equality. The player who misses, or whose ball is caught by the enemy, is out, and excluded from the rest of the inning. If the basemen are all out

first, the other side gets the bases for an inning. If the men in the ring are all out first, they must go back into the ring for another inning. It is possible for one side to hold the bases all day, but in practice the honors are pretty evenly divided.

When all the basemen but one are out, he may choose a partner, and they "smuggle" the ball. They conceal it under the coat of one, and both hold their hands under their coats as if they had it. Then they run the bases, and the enemy, not knowing which of the two has the ball, may be stolen upon and hit. But at any time a baseman can throw only from a base.

This is, so far as I know, the highest development of this class of ball-games. We have traced their natural history from the wanton hitting of one boy by another, through the hole-ball games, in which there are no bases and no sides, and the base-games in which there are two sides standing equal, on two bases, to the numerous bases occupied by one side as a token of victory. We have not yet encountered one of the most important instruments of ball-playing—the bat. This mighty engine of human amusement, whether in the form of a billiard-cue or a croquet-mallet, or what not, brings about radical variations in the game.

There is so much pleasure in the mere batting a ball that many a boy will amuse himself at it entirely alone for hours. He will gently toss the ball upward and as it comes down bat it either upward or horizontally. He will throw it against the barn-side and bat it on the rebound. He will lay the bat across a fulcrum and the ball upon one end of it, and then, striking the other end with his father's axe, drive the ball out of sight into the blue sky, catching it as it comes down. When several play at this, the privilege of striking being earned by catching the ball, the game is called "sky-ball."

If he can get another boy to toss up the ball, and he strikes it upward, the game used to be called "tip-e-up."

If the pitcher throws horizontally, a nameless and stupid game is produced. The pitcher earns the bat by catching the ball when struck. This was always so hard to do, in my experience, that the bat generally seemed in danger of becoming a hereditary possession of the batter.

It was much more fun to throw the ball against the barn, and standing behind the batter put him out by catching the ball when he struck at it and missed it on the rebound. This we called "barn-ball."

It was still better to divide the work of pitching and catching. There is division of labor, as the economists call it, in any batting game. There is also distinction of rank, the bat being always a token of victory—something to be struggled for and won. In all two-handed games the pitching, catching, fielding, etc., are all

done by a single player. In a three-handed game the work is further divided, there being now a batter, a pitcher, and a catcher. This we used to call "one old cat." The three players occupied the same positions now held by the same three players in the great American game.

Bases were now introduced. When the batter had struck the ball three times, he must run to the pitcher's base before the ball was thrown across his path in front of him. Otherwise he was out, and the player who "crossed him out" got his bat. There were, therefore, three ways of securing his bat: by catching the ball when he had struck it, by catching it when he had struck at it, and by crossing out when he ran bases. And there were two players at work trying to accomplish the object. The batter's life was rendered far less easy by these new features. Of course, every time the batter ran, the pitcher and catcher, instead of changing places, changed occupations.

If another batter was added, the two occupations of pitcher and catcher merged back into one. This was "two old cat." Its rules were usually the same as in the preceding game; but sometimes, instead of "every fellow for himself," it was "one out, all out." It was then a game of partners, like whist.

There was also "three cat," or "three-cornered cat," and even "four cat." The rules were the same.

One important difference between the batting and the hitting games was that, in the former, the complexity of the game increased with the number of players, while, in the latter, the simplest games were those in which the whole school could join. Up to eight players, the simple "old cat" games were the commonest. With more players than eight we usually played "town-ball." It was plainly evolved out of the cat games, for it retained all their rules. And it forms a connecting link between them and base-ball. But it resembles "one cat" more than any of the other forms of cat-ball. It might be called a lateral branch of the cat family, just as the lion and the tiger are related to the common cat. In ball-games the cat family had two principal lines of evolution. Along one line it bloomed into two, three, and four cat, and along the other line into town-ball, the professional base-ball, and one or two other allied forms.

Along the first line there was a mere cumulation of cats. All that is implied by this expression is that there was a multiplication of batting bases. After "one cat" there was just one batter and one catcher to each batting base.

In the other line we revert to the single batting base, regardless of the number of players. Even in "one cat" there were two, which were used alternately by the batter. His run was from one batting base to the other. Every time he ran, his former pitcher

became his catcher, and his catcher, pitcher—just as in the lower animals the same organ often has various functions to perform by turns. Just so, too, in rude societies, trades afterward widely separated may be united in the same person—as, for instance, the professions of barber and physician used to be united.

In the town-ball games, the pitcher was always pitcher until the game was ended or his arm was tired. The catcher was always catcher one game through, unless his hands blistered or his incompetency became apparent. In the professional games these two have permanent and well-paid positions. All the advantages mentioned by economists as resulting from "division of labor" are here illustrated.

In these games the conspiracy against the batter's peace of mind reaches appalling proportions. The conspirators are an organized band of indefinite numbers. Their lives are consecrated to the single end of putting him out. Even in "town-ball" one man has nothing to do but pitch him deceptive balls. Another has nothing to do but catch the balls he misses or only "ticks" or knocks foul. All the rest are scouring the field for his "flies," or stopping his "grounders" and crossing him out.

To add to his burdens, he is forced to run four bases instead of one. It was sufficient for any one of his numerous enemies to throw the ball across his path between him and the base to which he was running. This hardship is somewhat mollified in professional base-ball.

In "town-ball" there was as yet no distinction between basemen and fielders. After the pitcher and catcher had been selected, the others on that side went where they pleased; and they did not get the bat until they had put all the batters out. Nay, when all but one had been put out, he could sometimes call back to his assistance any one he chose of his slaughtered comrades; and he often had a rubber ball which, if he did not burst it, he could drive to the other side of the hay-field.

The professional batter has to contend with a curved ball, and go out when three of his comrades are out. But, on the other hand, the ball has to be pitched to him within definite limits, and he has to be touched with it when running.

Except mechanical details and minor rules changeable from year to year, these are all the differences between town-ball and base-ball. The rules were not so strict in the former, and there was no umpire to enforce them. They were often adopted by unanimous consent at the beginning of the game. One rule, often but not always adopted, was that the batter who knocked the ball over the fence was out. Another was that, when all the batters but one were out, one might be called back to "run bases." He had to make home runs—three of them within a maximum limit

of nine strikes. This was the most exciting part of the game, but was not a standing privilege.

Our good town-ball players developed into good base-ball players, and took to it quite naturally. In fact, the two might almost be called the same game under different names and at different ages. I believe it is quite common to speak of them in that way. Our town-ball was probably called base-ball in that part of the country where the game first began its rapid development; but, by the time the developed game had reached us, it was so different that for some years the two games were played side by side, each retaining its old name.

What caused this sudden development? The ingenuity and the wrangling of the boys had refined the game until adult men all at once saw the merit in it. Up to this point its rules had been wrought out and fought out on the vacant town lot or in the meadow surrounding the country school. It was pretty well understood that, unless fair rules were agreed on and held to, somebody would get hurt. The cry of "'Tain't fair!" would be raised and persisted in by the party infringed on. The other boys would soon tire of having the game delayed; and many a time have I seen them stop right there and adopt a new rule covering the case. It was always, as in the affairs of men, the courage and determination of the oppressed which brought about evolution and progress. It was the necessity of admitting reasonable claims and adopting acceptable rules in order to keep the peace and save time and strength.

When by these processes of ingenuity, goaded on by conflict, the boys had made it really a fine game, the men took hold of it and pushed it forward more rapidly, as men ought. They held their quarrels and set their rules in hotel parlors. They are still at it; and I should not like to say that many legislative bodies are engaged in business either more harmless or more profitable. Certainly a good many persons recuperate in worse ways than watching

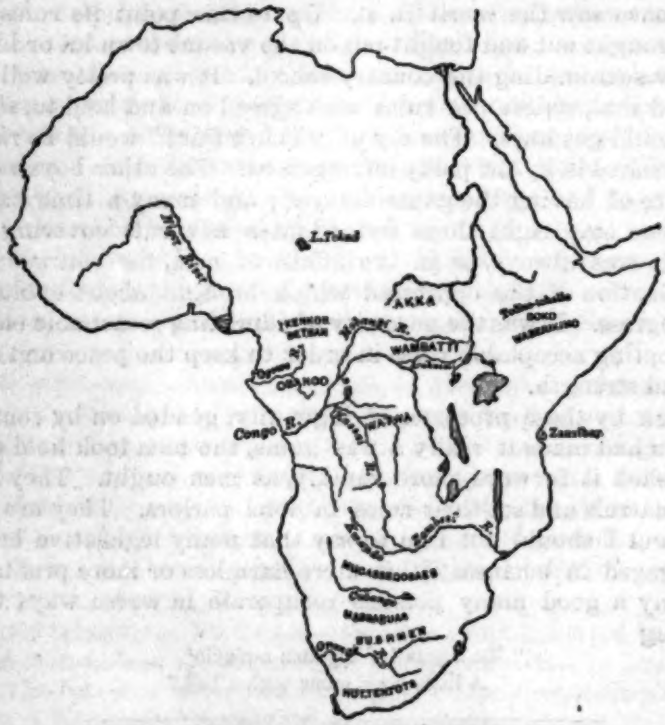
> "Jist a passel o' big men a-playin'
> A little boys' game with a ball."

MISTAKES in orientation usually result from some incidental and temporary bewilderment, which may, under peculiar circumstances, overtake any one. Instances are cited by Sir Charles Warren in which they are chronic. Erroneous conceptions formed by children as to distances and positions may grow up with them undetected till near their maturity. Then, when the defect is revealed, it will be too late to apply any other remedy than to recognize it, and make such allowance for it as is possible. Probably few persons have grown up without forming some errors of the kind which they have found it impossible to get rid of. The defect may account for some of the accidents that occur on railways and shipping.

THE AFRICAN PYGMIES.

By A. WERNER.

NOT the least interesting of the discoveries made by Mr. Stanley on his latest expedition is that of the Wambatti—the dwarf tribe living between the upper Aruhwimi and the Nepoko. It has long been a well-known fact that the Pygmies of Homer, Herodotus, and Ktesias—those of whom Pliny speaks as "dwelling among the marshes where the Nile rises"*—are something more than mere mythical beings; and almost every exploration of any importance undertaken of late years has thrown fresh



light on the existence of a primitive African race, of whom the Wambatti, Akkas, Obongo, Watwa, and Bushmen are, in all probability, scattered fragments.

A glance at the accompanying rough map will show how numerous are the tribes—usually designated dwarfs or pygmies—whose marked resemblance to each other, and marked difference from the people among whom they are scattered, are recognized

* Hist. Nat., vi, 35.

facts. The physical characteristics in which, broadly speaking, they all agree, are their small stature, their light-yellow or reddish-brown color, and the peculiar character of the hair, which is woolly, but, instead of being, as in the negro, evenly distributed over the scalp, grows in small tufts—"cheveux plantés en pinceaux de brosse," as Emin Pasha puts it in speaking of the Akkas.* This appearance, according to Prof. Virchow, is not due to the fact that the hair grows on some spots and not on others, but to a peculiarity in the texture of the hair itself, which causes it to roll naturally into closely curled spiral locks, leaving the intervening pieces of scalp bare. Be this as it may, this growth is the surest and most permanent characteristic of the Pygmy, or, as some prefer to call them, the Hottentot-Bushman race.†

The name of dwarfs, applied by some to these people, has been objected to as implying deformity or arrested growth, and therefore conveying a wrong impression. Nothing of the kind can be said of the African Pygmies, who, though of short stature, are well-shaped people of perfectly normal formation. It is true that the Hottentots and Bushmen show certain strange anatomical peculiarities; but these may be said to be more or less accidental, being, in part at least, the result of special and unfavorable conditions of life.

The Pygmies are nomadic in their habits,‡ and neither keep cattle nor till the ground, but live by hunting and snaring wild animals and birds, or, under the most unfavorable circumstances, on wild fruits, roots, and berries. Their weapons are always bows and arrows, the latter usually poisoned—the resource of the weak. They have no fixed abode, and, if they build shelters at all, only construct rude huts of branches. They have no government, nor do they form regular communities; they usually wander about, like our gypsies, in hordes composed of a few families each. This,

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* Transactions of the Berlin Anthropological Society for 1886.

† Prof. Flower, however, thinks that differences between the Akkas and Bushmen are so radical as to preclude the possibility of regarding them as members of the same race. He lays special stress on the yellow complexion and "peculiar oblong form of the skull," which is especially distinguished from that of the Akkas by the absence of prognathism; also on the "special anatomical characters" alluded to later on. But it seems to be the case that modern research tends to show that environment and conditions of life, etc., may act far more quickly in the production of racial peculiarities than was formerly supposed. There are instances, e. g., on record of the children of white, or at most tawny parents, born in a hot, damp locality (to which the latter had migrated from a dry one) being positively black. The Bushmen have been isolated to such a degree from their more northern congeners, and the struggle for existence has been in their case so severe, that they may well have developed striking differences. It should be noted that their habitat is dry, while that of the Akkas is extremely hot and damp.

‡ Les Akkas ne forment point un peuple compact; il n'y a pas un pays aux Akkas; comme les volées des oiseaux, ils sont un peu partout.—Emin Pasha.

however, depends on the nature of the country—in the parched deserts of the south they are not even united to this extent. Sometimes they are to a certain extent dependent on more powerful tribes, who afford them protection in return for certain services. Their notions of the Unseen, when they have any, would appear to be of the very crudest. Their languages seem to be distinct from others, related among themselves, and very peculiar. This is a point to which I shall revert later on.

Leaving aside the classical writers,* the earliest reference to the Pygmies occurs in the narrative of Andrew Battell,† who spent three years in the kingdom of Loango during the first decade of the seventeenth century. He says:

> To the north-east of Mani Kesock are a kind of little people called Matimbas, which are no bigger than Boyes of twelve yeares olde, but verie thicke, and live onely upon fleshe, which they kill in the woods with their Bowes and Darts. They pay tribute to Mani Kesock, and bring all their Elephants' teeth and tayles to him. They will not enter into any of the Marombos' houses, nor will suffer any to come where they dwell. And if by chance any Marombo, or people of Loango passe where they dwell, then they will forsake that place and go to another. The Women carry Bow and Arrowes as well as the men. And one of these will walk in the Woods alone, and kill the Pongo with their poysoned Arrowes.

The Flemish geographer Dapper, writing in the seventeenth century, refers to the Pygmies in the following passage:

> Before the King's cloth sit some Dwarfs, with their backs towards him; Pigmies indeed in stature, but with heads of a prodigious bigness; for the more exact deforming whereof they wear the skin of some Beast tied round about them. The Blacks say there is a Wilderness where reside none but men of such a stature, who shoot those Gigantick Creatures, the Elephants. The common name of these dwarfs is Bakke-Bakke; but they are also called Mimo's.‡

These Bakke-Bakke (whose name reminds us of Akkas, Tikki-Tikki, and Wambatti, and possibly Batwa) seem at first sight to come under the heading of true dwarfs, or natural malformations; but the disproportioned heads may be an accidental mistake magnified by report. The other items of the account tally with the descriptions of Battell and others—the skins of beasts, worn "for the more exact deforming of the head," are probably the leopard and monkey skin caps worn among many of the Congo tribes at the present day.

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* An excellent summary of what is said by these, and also of modern discoveries up to 1871, is given in an article, Ueber Zwergvölker in Africa (to which I have been greatly indebted in the preparation of this paper), in Petermann's Mittheilungen for that year.

† Purchas, vol. ii, p. 983.

‡ Description of the Kingdom of Lovango, or the Countrey of the Bramas in Nether Ethiopia. (Africa: Collected and translated from most authentick Authors. By John Ogilby, Esq. 1670.)

De Commerson, who accompanied Bougainville on his voyage round the world, and visited Madagascar in 1771, heard of a small race in the interior of that island, called Kimos or Quimos, and actually saw one woman—a slave in the household of the governor of the French settlement, the Comte de Modave. De Modave collected all the information he could about the Quimos from native chiefs, but never succeeded in reaching the valleys where they were said to live, or meeting with any, except the slave-woman before mentioned, who may or may not have been a typical specimen. Ellis and other missionaries, in later times, heard of these people under the name of Vazimba, but never appear to have seen them; and it may be doubted whether any of them exist at the present day. The native statements preserved by De Commerson and De Modave would, if true, show the Quimos to have been in some respects physiologically different from the rest of mankind; but these statements—and rightly so, in the absence of further evidence—are treated by both gentlemen with extreme caution. For the rest, the description of the Comte de Modave's Quimo slave might very well stand for the portrait of the average Bushwoman.

Captain Boteler, who was on the east coast of Africa, between the years 1821 and 1826, heard of a tribe of small people, living in the interior, called Waberikimo; and reports of these seem at different times to have reached Zanzibar. The native information on this point was somewhat vague; but from all accounts they would appear to be the same as the Doko, of whom Dr. Krapf received a description in 1840 from a slave of the name of Dilbo, a native of Enarea. The Doko were said to live in the Galla country; they were small in stature, and of a dark olive color. They lived on fruits, roots, mice, and wild honey, and were unacquainted with the use of fire. They had neither weapons, houses, nor temples, nor even, like the Gallas, sacred trees. Yet they had some notion of a Supreme Being, to whom, under the name of *Yer*, they sometimes addressed prayers, "in moments of sadness and terror," said Dilbo. There is a certain pathos in what follows; but we must remember that it was filtered through the imagination—perhaps elicited by the leading questions—of a kind-hearted German with a touch of poetic mysticism about him. "In their prayer they say: 'Yer, if thou dost really exist, why dost thou let us be slain? We ask thee not for food or clothing, for we only live on snakes, ants, and mice. Thou hast made us, why dost thou let us be trodden down?'"

The Doko had neither chiefs nor laws; they "lived in the woods, climbing trees for fruit, like monkeys"; but diseases were unknown among them, and they were much liked as slaves in Enarea, being docile and obedient.

Dr. Krapf again heard of the Doko in Ukambani and at Barawa, and at the latter place even saw a slave corresponding to Dilbo's description. Father Léon des Avanchers, a French Roman Catholic missionary, heard of them from the Somalis in 1858, under the name of "Tchin-Tchellé" (which is, being interpreted, *Quel miracle!*). In 1864 he saw some of them for himself in the kingdom of Gera (north of Kaffa, in Abyssinia), and described them in a letter to M. d'Abbadie, published in the Bulletin of the Paris Geographical Society. The word Doko may be another form of the Swahili *mdogo* (= small), but this has been disputed.

Proceeding in geographical rather than in chronological order, we come next to the Akkas, with whom Colonel Long's Tikki-Tikki* would seem to be identical. They were first heard of, vaguely, by Petherick, in 1854; but the first real announcement of their existence to the civilized world was made by Dr. Schweinfurth in 1871. They live in the Monbuttu country, which lies south of the Bahr-el-Gazal and west of the Equatorial Province of Egypt. Dr. Schweinfurth's account has been ably supplemented by Dr. Felkin and Emin Pasha, the latter of whom enjoyed ample opportunities for studying them during the twelve years he spent in Central Africa, and in 1886 communicated to the Berlin Zeitschrift für Ethnologie a very valuable and interesting paper on the subject, accompanied by detailed measurements. He insists on the distinction between the Akkas and real dwarfs (i. e., persons whose growth has been arrested by pathological or other causes), of whom he saw several at Mtesa's court. "Tout au contraire, les Akkas sont une race qui n'offrent aucun signe pathologique, mais qui, formés à point, déprécieraient bien vivement les épithètes de 'race déchue,' de peuplade vouée à l'extinction, dont on a bien voulu les gratifier." They live in bands composed of a few families each, putting up the rough shelters of reeds and branches which form their temporary camp in the woods, near some running stream, and usually within reach of a Monbuttu or Momvu village. They are good marksmen, and kill even elephants and buffaloes, bartering with the villagers the meat they do not require for themselves, in return for grain, oil, native beer, and other necessaries. The Monbuttu, moreover, obtain from them all the skins and feathers used by them for clothing and ornament; and any chief who should refuse hospitality to the Akkas would not only forfeit these supplies, but draw down the speedy vengeance of the little people the first time he or any of his tribe ventured into the forest alone. The Akkas are cannibals, and make no secret of the fact; those personally known to Dr. Schnitzer "savaient parfaitement me dire quelle part du corps

* Central Africa. By Colonel C. Chaillé-Long. London, 1876. Pp. 263 *et seq.*

humain soit la plus savoureuse."* The average height of some thirty individuals measured by the pasha was 1·36 metre. They are usually of a lighter brown than the Monbuttu, but the difference of coloring is rather in the *tone* than in the *shade*—in other words, the Akkas are of a *red*-brown, the Monbuttu of a *yellow*-brown.† Their hair is black-brown or quite black, growing in tufts, as already described, short and very woolly, and too scanty to be made into the ornamental coiffures so much in vogue among the Africans. There is an abundant growth of hair all over the body, and "it can not be denied that the mouth resembles that of certain apes." This is noteworthy when contrasted with Dr. Wolf's remark on the Batwa, "Irgend welche pithecoide Merkmale waren nicht vorhanden." The Monbuttu frequently intermarry with the Akkas, and half-breeds are far from uncommon. Two Akkas were sent to Italy by Signor Miani, one of whom, we believe, is still living at Verona.

The Wambatti, first made known to the world by Mr. Stanley's narrative, live farther west than the Akkas, from whom they do not appear to differ materially—unless it be in the "spiteful and venomous" disposition evinced by their unprovoked attacks on the expedition; whereas the Akkas, though dangerous on provocation, are tolerably peaceable when well treated.

Within the great horseshoe bend of the Congo, and apparently ranging over a vast extent of country, dwell the Watwa or Batwa. Mr. Stanley first heard of them in 1876, from Rumanika of Karragwé, and, later on, at Nyangwé, from Abed bin Jumah, who, in a singularly picturesque and graphic narrative, recounted the tragic history of Sheik Mtagamoyo, the cruel and dauntless—how he fitted out a strong caravan for the country of the dwarfs, expecting to make his fortune in ivory, and went back poorer than he came.‡ Stanley did not himself come in contact with these Watwa, except in the person of a single individual who was brought in by his men at Ikondu, on the upper Congo or Lualaba River.* He measured three feet six inches and a half in height, was "light chocolate" in complexion, and carried a bow and poisoned arrows.

Mr. H. H. Johnston,‖ in 1883, saw two slaves among the Bayansi, near the Kwà River, who probably belonged to this race.

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* Thus differing from Winwood Reade's Fan acquaintance, who assured him that, considered as a dish, man was "all alike good."

† "Tandis que les Akkas appartiennent aux peuples nègres dont le fond du noir est *rouge*, les Mombouttous montrent un brun ou noir au fond *jaune*." This appears to contradict the general tenor of what has been said about the Pygmy races, but it is probable that no hard-and-fast rule can be laid down as to color.

‡ Through the Dark Continent, pp. 390–393.

* Ibid., pp., 435, 436.

‖ The River Congo, p. 215.

More extended observations were made in 1885 by the late Dr. Ludwig Wolf, who accompanied Lieutenant Wissmann's expedition, and spent some time in the Kassai region. He says that the Batwa in some places live side by side with the Bakuba—in others they have settlements of their own, hidden away in the dense forest. They are most numerous about the parallel of 5° south. Each sub-chief of the Bakuba has a Batwa village assigned to him, whose inhabitants supply him with palm-wine and game. The independent Batwa of the forest sometimes offer dried meat in exchange for *manioc* or maize to the Bakuba, at periodical markets held on neutral ground. Dr. Wolf experienced some difficulty in obtaining accurate measurements; but the first series of those he was able to record gave 1·44 * metre as a maximum, and 1·40 m. as a minimum. On a later occasion he found that the heights obtained ranged between 1·30 m. and 1·35 m.—which last figure is somewhat less than that given for Stanley's dwarf.

Dr. Wolf was disposed to think that there is in this respect little if any difference between the Batwa and the Bushmen. For the rest, he says that they were in general tolerably well formed, "und machten durchaus den Eindruck des Normalen." The skull was not markedly prognathous, and no ape-like peculiarities were noticeable. They followed no particular custom in the disposal of their dead, and were, like other Africans, firm believers in witchcraft.†

According to Major Wissmann, these Batwa hunt with dogs, and, indeed, possess a superior breed of greyhounds.

Mr. C. S. Latrobe Bateman, in Under the Lone Star, speaks of two nomadic tribes—the "Batwa Bankonko" and the "Batwa Basingi"—the former of whom were the terror of the Bakete, who, to obtain protection from them, became tributary to the Bakuba. He makes no mention, however, of their racial peculiarities.

The Obongo, discovered by Du Chaillu in 1865, inhabit the Ashango country, in the mountains south of the Ogowé. They were "stoutly built, like chimpanzees," with broad chests and muscular limbs; some of them were not more than four feet in height, others from four feet two inches to four feet seven inches. They were "of a dirty-yellow color," with hair growing in tufts; and lived in the same sort of relation to the Ashangos as the Batwa to the Bakuba. A full description of their settlement and its little circular huts made of branches may be found in Du Chaillu's Ashango-Land.‡

The same people were seen by Dr. Lenz, when he ascended the

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* About four feet nine inches and a quarter.

† Transactions Berlin Anthrop. Soc., 1886.

‡ Pp. 315 *sqq.*

Okanda (a tributary of the Ogowé) in 1874. He found that they were called "Babongo," and also "Vambuta" (Wambatti ?), though their real name appeared to be Bari or Bali. As he did not penetrate farther than 12° east, he did not reach their actual dwelling-places, which were said to be a fortnight's journey beyond that point, though he saw and measured a considerable number of individuals. His measurements range between 1·32 and 1·42 metre, and he particularly notices the contrast between their round huts and the rectangular style of architecture prevailing in the district.*

Somewhere to the north of these, perhaps, may be placed the Kenkob and Betsan, of whom Dr. Koelle, the learned author of the Polyglotta Africana (1854), heard at Sierra Leone. He obtained his information from two liberated slaves, one of whom, a man named Yon, was a native of a country called Bayon, supposed to lie about 5° north, and between 12° and 13° east. This man declared that four days' journey eastward from his home there was a great lake called Liba, on whose banks lived the Lufum tribe, "tall, strong, and warlike; clad in black monkey-skins, and fighting with spears and arrows. Near Lufum," the account continues, "and also on the shores of the Liba, is another people, called Kenkob, only three or four feet high, but very stout, and the most excellent marksmen. They are peaceful, live on the produce of the chase, and are so liberal that if, e. g., one has killed an elephant, he would give the whole of it away."

Another man, whose home was to the northwestward of Bayon, gave Dr. Koelle a very similar account of a tribe called "Betsan," living "on the river Riba,† which comes from Bansa and goes to Bambongo." These, too, are successful hunters, and are also said to make bark cloth for themselves, whereas Du Chaillu's Obongo wore nothing but the cast-off grass cloths of the Ashangos. The Betsan sometimes exchange their venison for millet, etc., in the Rufum country. "They do not cultivate the ground, but are constantly on the move, changing their abode every six or twelve months. Their houses can be easily built, taken down, and even carried along with them, consisting as they do of the bark of a large tree. The Betsan hunt monkeys, baboons, wild hogs, deer, elephants, etc." ‡

I can suggest no affinity for the names here given to the Pygmies, unless Kenkob contains a possible reminiscence of "Khoi-Khoi," or "Koi-Koib," the tribal name used by the Hottentots among themselves. It is utterly unlike a Bantu word, and may be a relic of the language originally common to all the Pygmy tribes,

* See Petermann's Mittheilungen for 1877 (p. 108); also Dr. Lenz's paper in the Transactions of the Berlin Geographical Society.

† Evidently the same as Liba; as Rufum-Lufum. ‡ Polyglotta Africana, p. 12.

which many of them seem to be losing. Bambongo, on the other hand, distinctly suggests Obongo, and may have originated the latter name (which, as the variant *Ba*bongo shows, seems to be Bantu)—the Kenkob adopting it from the district where they had sojourned. Or, again, it may be a tribal name, reported to Dr. Koelle's informant as that of a district.

Turning to southwestern Africa, we find that Major Serpa Pinto,* in 1878, met with a tribe called "Mucassequeres," living in the forests between the Cubango and Cuando, while the open country is occupied by the Ambuellas. These people have "eyes very small and out of the right line, cheek-bones very far apart and high, nose flat to the face, and nostrils disproportionately wide." Their hair is crisp and woolly, growing in *separate patches*, and thickest on the top of the head. Unlike the Obongo, they build no kind of shelter, but, like them, are skilled in the use of bows and arrows, and live on roots, honey, and game. In color they are "a dirty yellow, like the Hottentots, while the Ambuellas are black, though of a Caucasian type of feature."

Farther south, near the borders of the Kalahari Desert, Serpa Pinto found a tribe similar in most respects to the Mucassequeres, but deep black, and known by the name of Massaruas. These (who are less savage than the Mucassequeres) are probably a tribe of Bushmen, very much resembling, if not identical with, the M'Kabba, or N'Tchabba, brought by Signor Farini from the Kalahari Desert. These last were carefully examined by Prof. Virchow, and described by him in a paper read before the Berlin Anthropological Society, March 20, 1886.

We have now to notice the section of the Pygmy race with which Europeans have come most in contact—the Hottentots and Bushmen. The Hottentots (as they are now known to us, their real name for themselves being "Khoi-Khoi" †) represent probably the highest development of the race, and differ notably from its other members in being a pastoral people. When Van Riebeek landed at the Cape in 1652 they existed in great numbers, roaming the country with large herds of cattle. Kafir wars and Dutch "commandoes," with other causes, have so far thinned them out that few if any genuine "Cape Hottentots" now exist, their place being taken by the Griquas and other tribes of mixed race. Two cognate tribes, the Korannas ‡ and Namaquas, still exist, but in diminished numbers.

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* How I crossed Africa, vol. ii, pp. 320 *sqq.*

† Or Koi-Koib ("men of men"), according to Dr. Cust. The Kafirs call them "Lawi." "Hottentot" is merely a nickname given by the early Dutch settlers, who declared the natives spoke an unintelligible language, consisting only of sounds like *hot* and *tot*.

‡ Some ethnologists are inclined to look on the Koranna tribe as a cross between Hottentots and Bushmen.

That keen observer, Moffat, as long ago as the first decade of this century, noticed the distinct and peculiar characteristics of the Hottentots, and recognized their racial identity with the Bushmen. He speaks of "that nation, which includes Hottentots, Korannas, Namaquas, and Bushmen," and describes them, as a whole, as "not swarthy or black, but rather of a sallow color, and in some cases so light that a tinge of red in the cheek is perceptible, especially among the Bushmen. They are generally smaller in stature than their neighbors of the interior; their visage and form very distinct, and in general the top of the head broad and flat; their faces tapering to the chin, with high cheek-bones, flat nose, and large lips." He further notes that the first three speak languages which are mutually intelligible, while that of the Bushmen, though cognate, is quite distinct. Writing (after his return to England) in 1842, when as yet the Akkas and Batwa were unknown to science, he suggests that, "when the sons of Ham entered Africa by Egypt, and the Arabians by the Red Sea, the Hottentot progenitors took the lead and gradually advanced, as they were forced forward by an increasing population in their rear, until they reached the ends of the earth." He further remarks, "It may also be easily conceived by those acquainted with the emigration of tribes that, during their progress to the south, parties remained behind in the more sequestered and isolated spots where they had located while the nation moved onward, and research may yet prove that that remarkable people originally came from Egypt." In corroboration of this theory he mentions having heard from a Syrian who had lived in Egypt of slaves in the Cairo market, brought from a great distance in the interior, who spoke a language similar to that of the Hottentots, and were not nearly so dark-colored as negroes in general. These must certainly have been Akkas.*

As for the Bushmen, we have pretty full accounts of them from various sources. Moffat has much to say about them—too much to quote in full—which may be found in the first and fourth chapters of his Missionary Labors in South Africa, and is supplemented by Livingstone in the Missionary Travels.

Mr. Alfred J. Bethell (in a letter to the Standard which appeared on April 26, 1889) says that the Bushmen proper are now "nearly if not quite extinct," the people now so called being outcasts from the Matabele, Bamangwato, and other Bantu communities. Mr. A. A. Anderson,† however, who extended his

* Winwood Reade's remark (African Sketch-Book, vol. ii, p. 528), written in 1873 or earlier, is worth notice: "His (Du Chaillu's) discovery of the Dwarfs (*who are certainly Bushmen*) is an important contribution to the ethnology of Africa."

† Twenty-five Years in a Wagon in South Africa, vol. i, pp. 235, 282, etc.; vol. ii, p. 74.

journeys far beyond the northern limits of the Transvaal, makes frequent mention of them and discriminates four distinct types, noticing especially a very light-colored variety only found in the Drakensberg Mountains and the ranges west of them. There seems to be a tradition of hostility between the Bushmen and Hottentots, and the difference between them in pursuits and habits has always been sharply marked; but the fact of their affinity has seldom or never been questioned. Moffat distinctly states his belief (supported by the analogy of the Balala or outcast Bechuanas) that they are the descendants of Hottentots driven by want and the hostility of stronger neighbors into the desert. Generations of perpetual living on the edge of starvation have made of them the gauntest and skinniest of shapes—seemingly designed by Nature to show what human beings can endure in that line and live—and developed in them, in spite or because of their physical weakness and insignificance, a cunning and an intimate knowledge of nature that to the savage mind seems little short of superhuman. Some of the Kafirs believe that the Bushmen can understand the language of the baboons, and countless instances of their skill in tracking game and finding water are on record. They possess a wonderful gift of mimicry, can imitate to the life the action of any man or animal, and have a passionate love of music. They can evolve from their primitive instruments—the *gorah*, with its catgut and quill, or the hollow gourd-shell, with strings stretched across it—plaintive melodies of a surprising sweetness, very different from the hideous *tintamarre* of horns and tomtoms which delights the heart of the average African. Moreover, having a quick ear and a retentive memory, they will pick up and repeat any civilized tune once heard—whether the *Chorales* of the German Mission or the more secular ditty sung by the wandering traders. Their poisoned arrows, and their noiseless, furtive ways of coming and going, inspire the stronger races with a vague dread of them, strengthened no doubt by that uncanny something which, as Mr. F. Boyle remarks, "makes a Bush-boy resemble a bird the more, the more he shows a simian intelligence."

We have thus, in a hasty and imperfect manner, surveyed the known fragments of the aboriginal African race. We have seen that they resemble each other to a great extent in physical conformation and in manners and customs; the differences being for the most part due (like the extremely poor development and degraded way of life of the Bushmen) to differences in habitat and environment. The Hottentot and Sàn or Saab (Bushman) languages we have seen to be related, though distinct; and they are radically different from every known Bantu tongue. Some have even denied that they are articulate speech at all. The peculiarity

of the "clicks" has often been insisted on;* another distinguishing characteristic is the existence (at least in the Hottentot language) of grammatical gender—a feature wholly absent from the Bantu tongues. The Bushman language is said to be monosyllabic. The Hottentots, however, now mostly speak Dutch—or that variety of it to be heard at the Cape—and probably both languages are on the way to extinction. It is said that "a missionary, being invited by the Government to send books in the Kora† dialect to be printed, remarked that his experience was that it was easier to teach the young to read Dutch, and that the old could not learn at all."‡

An examination of the list of Batwa words collected by Dr. Wolf, as compared with his Baluba and Bakuba vocabularies, and the Congo and Swahili languages, has convinced me that the Batwa, if they have not adopted and modified the speech of their neighbors, have at any rate adopted a great many Bantu words into their own. The numbers up to ten, for instance, are identical (with slight differences of pronunciation) in the Batwa and Baluba languages. But as yet the materials for comparison are too scanty for any definite statement to be made. The few words elicited from the dwarf met by Stanley were, as Mr. Johnston points out, decidedly Bantu; but we need not conclude from this that the Pygmy race consists merely of outcast and degenerate Bantus. What more likely than that a small and isolated tribe, who, like the Batwa, frequently had friendly intercourse with surrounding and more powerful tribes, should, to a certain extent, adopt the language of the latter?

Surveying the Pygmy race as a whole, we find them—shorn of the mythical and magical glamour with which distance and mystery had invested them—not so very different, after all, from other human beings, but still sufficiently interesting. There is a shock of disillusion in passing from the elves and trolls of a past age—not to mention Alberic of the Nibelung's Hoard—to the worthy but prosaic Lapps of the present day; and the "little people" of whom Bwana Abed entertained such a vivid and unpleasant recollection were doubtless minimized in stature by the retrospective imagination. No well-authenticated adult Mtwa, Akka, or Mbatti seems to be much less than four feet six inches; while Dr. Petermann thinks that the Pygmies, on the whole, run about a head shorter than the average negro. This may be disappointing to those who are ever on the lookout for the marvelous—by which they mean the abnormal—but the facts as they stand pre-

* Some of the Kafir languages possess these clicks, but they have undoubtedly been borrowed.

† Spoken on the Orange River.

‡ Modern Languages of Africa. By R. N. Cust.

sent quite sufficient food for thought to a more rational frame of mind.

I can not attempt to deal with the origin of the Pygmy race, or its relationship to the Andamanese and the Veddahs of Ceylon, who are said to have some characteristics in common with them. But it seems clear that they were once spread over a great part if not the whole of the continent; that they were broken up and partially exterminated by the advent of the stronger dark races; and that, as a race, they are passing away. It is interesting to look at an analogous case in Europe. A race of small stature, slight frame, and comparatively low type, scarcely, if at all, advanced beyond the hunter stage, occupied the British Islands and the northwestern part of the continent. They were partly massacred or enslaved, partly driven into the mountains by their Celtic conquerors; and in the lonely recesses of the hills and woods—what with their weakness and their strength, their cunning and their skill in metals, their music and their underground dwellings, and their strange, uncanny wisdom—a growth of legend and poetry sprang up about them, till they were no longer known save as elves, gnomes, trolls, or "Good People," whom one dared not name.

It is somewhat suggestive, as bearing on the question of the original immigration into Africa, to note that there was, as late as the sixteenth century, a Pygmy tribe living in Arabia, who may well have been a detachment left behind when the main body crossed the Isthmus of Suez. So far as I am aware, the only authority for this fact is Lodovico di Bartema, otherwise known as Ludovicus Wertomannus, whose narrative of a visit to Mecca (about 1500) is contained in vol. iv of Hakluyt's Voyages. This account runs thus:

> In the space of eyght dayes we came to a mountayne which conteyneth in circuit ten or twelve myles. This is inhabited with Jewes to the number of fyve thousand or thereabout. They are very little of stature, as of the hyght of five or sixe spannes, and some muche lesse. They have small voyces like women, and of blacke colour, yet some blacker than other. They feede of none other meate than goates' fleshe. They are circumcised, and deny not themselves to be Jewes.

This last sentence, apparently, contains the evidence for their Judaism. It is now well known that the rite in question is commonly practiced in Africa, and by the Hottentots, among others. What has become of these "Jewes" does not appear. Probably they have gone the way of nearly all the Bushmen. Will the Akkas and the rest follow them? As a race they are doomed to pass away; yet this need not imply—we hope it does not—that they are to be massacred, or starved out of existence. It was long believed that the Celtic Britons had been utterly exterminated

(except in Wales and Cornwall) by the Teutonic invaders, whom the older school histories taught us to consider as our exclusive ancestors. When the existence of the older, dwarfish, Euskarran or Neolithic race was discovered, it was at first supposed that they had in like manner been made a clean sweep of by the Celts. Recent researches have made it probable that this was by no means the case; indeed, Mr. Grant Allen thinks that there is a considerable Euskarran element in the English population of to-day. The black-haired aborigines—what was left of them—gradually amalgamated with the light-haired and blue-eyed Celts; and these were, in turn, absorbed by the English properly so called. And we have seen that the Griquas and other mixed races exist in Cape Colony, some, at least, of whom have shown themselves capable of being respectable and useful in their generation; and it is at least possible that these mixed races may survive, and in time amalgamate with the Bantu.—*The Gentleman's Magazine.*

THE MIGRATION OF SYMBOLS.

By the COUNT GOBLET D'ALVIELLA.

I.

MEN, to communicate their thoughts, address themselves sometimes to the ear, by speech, song, or music; sometimes to the eye, by gesture, drawing, and the plastic arts generally, including writing. These modes of expression may have an imitative character, as when a savage describes an animal by its cry, or as in a photograph; but even then they have a symbolical bearing, in that they recall only some of the features of the original, and leave the rest to the imagination or to memory. We might define a symbol as a representation which does not aim to be a reproduction. Reproduction supposes that the representative sign is identical with, or at least like, the object represented; symbolism demands only that one may recall the other, by a natural or conventional association of ideas. In this sense there is nothing that may not furnish matter for a symbol. We live among symbolical representations, from the flags over our public buildings to the bank-note in our strong-box; symbolism is mingled with all our intellectual and social life, from the morning hand-shaking to the applause we give to the actor in the evening. Our arts are symbolical, even when they are believed to be only servile imitations of nature. We speak and write in symbols—and even think in them, according to the philosophical systems that are based on our impotency to grasp the reality of nature.

Sentiment, particularly religious sentiment, recurs most largely

to symbolism in order to enter into a more intimate communication with the being or abstraction which it desires to approach. Hence we everywhere see men either adopting natural or artificial objects that remind them of the great absent one; imitating systematically the acts and gestures they assign to it; or objectizing, by processes as various as significant, all the shades of feeling which it inspires in them, from the deepest humility to the most ardent love. Hence the extreme diversity of symbols, which may be divided into two classes, as they consist in acts or rites, or in objects and emblems. We shall occupy ourselves here with the second category, or rather with the figured representations which it has inspired, and which past generations have transmitted to us as material vestiges of their faiths. Studies in comparative symbology fell, toward the second half of the century, into a discredit which is accounted for by their previous history. Syntheses premature as they were brilliant, built up with insufficient and defective materials by the rationalistic school, were succeeded, about fifty years ago, by the system, more philosophical than historical, which found, in all the religious practices of antiquity, the disguised or transfigured reflection of a profound primitive wisdom. These theories all having given way under the contradictions brought against them by discoveries in archæology, ethnography, linguistics, etc., a reaction ensued as extreme as the former infatuation. A disposition appeared to banish hypothesis entirely from all research into the origin and significance of symbols; as if hypothesis—provided it is not treated as an assured fact—were not an essential factor of all scientific progress.

But the situation has greatly changed within thirty-five years. Data permitting comparison under all desirable conditions of authenticity, of the figured representations of different peoples, have accumulated in such proportions that the principal obstacle will lie hereafter in their multiplicity and dissemination. Excavations of ancient monuments in Asia and Africa, the archæological collections of even the smallest states, the societies devoted to every special branch of the subject, and the studies of the whole, directed from the most varied points of view, have made the tasks relatively easy of students who would follow the traces and elucidate the meaning of the principal symbols. On the other hand, the deciphering of inscriptions, the classification and interpretation of written documents, and the general advance of history, of religious history in particular, by informing us concerning the beliefs of peoples, enable us the better to define the relation of their symbols with their myths and their ceremonies, at the same time that a more exact knowledge of the social and geographical medium in which the symbols originated assists us in tracing the origin of the images which have given body to the ideas.

After this there are no reasons why we should not reach as positive results in the study of symbols as in the study of myths. The comparative examination of myths long ago assumed a scientific phase, both with Mr. Max Müller and the linguistic school that is correlating the traditions of nations speaking allied languages, and with Mr. Andrew Lang and his fellow ethnographers who are comparing the mythologies of all known peoples. Now, the myth, which we may define as a dramatization of natural phenomena or of abstract events, offers more than one common trait with the symbol. Both rest on reasoning by analogy, which in the one case creates a figurative story, and in the other a material image. There is, however, the difference that in the symbol we are aware of a distinction between the image and the being or object represented by it, while an essential character of the myth is that the story shall be supposed to be conformable to the reality. But it is easy to see that both are frequently formed by the aid of the same processes and are transmitted by the same ways.

At all events, there are religions that we can not explain unless we endeavor to supplement the insufficiency of the texts by the study of the figured monuments; and there is an increasing disposition among students of particular religions to make use of the texts to prove the symbols, and of the symbols to prove the texts—as in M. Senart's recent works on the history of Buddhism; MM. Gaidoz's and Al. Bertrand's on the symbols of ancient Gaul; those of M. J. Menant on the engraved stones of upper Asia; and those of M. Ch. Lenormant, Clermont-Ganneau, Ledrain, and Ph. Berger on the figured representations of the Semitic religions. These labors are the best demonstration of the services which the interpretation of symbols can render to the history of religions, provided we observe all the rigor of scientific methods.

It is not necessary to insist here upon the interest which the study of symbolism offers, aside from the services which it may be called upon to render to archæological science. Representation by symbolism is, in literature, religion, and art, a necessity of the human mind, which has never been able to content itself with pure abstractions, or to restrict itself to the external shape of things. Under the material and often incoherent forms by which past generations have expressed their aspirations and their faith, we can discern the beating of a heart, the appeal of a soul to other souls, a mind that seeks to embrace the infinite in the finite, to objectize, under features furnished by Nature or the imagination, its conceptions most approaching a reality indiscernible in its plenitude. The symbols which have attracted in the highest degree the veneration of multitudes have often been indeed absurd and gross representations of gods; but what have the gods themselves ever been, except symbols more or less imper-

fect of the Being, superior to all definition, which the human mind has discerned more clearly according to its development, through and above them all?

It seems as if the variety of symbols should be without limits, as are the combinations of the human imagination. But we not rarely find the same symbolical figures among the most distant peoples. Such coincidences can hardly be explained as matters of chance, like the combinations of the kaleidoscope. Aside from the case of symbols found among peoples belonging to the same race, which can be traced back to the common cradle, there are only two possible explanations of them. The images have either been conceived separately, by virtue of some law of the human mind, or they have passed from one country to another by borrowing.

There is a symbolism so natural that, like certain implements peculiar to the Stone age, it does not belong to any particular race, but constitutes a characteristic trait of mankind at a certain phase of its development. Of this class are representations of the sun by a disk or radiating face, of the moon by a crescent, of the air by birds, of water by fishes or a broken line, of thunder by an arrow or a club, etc. We ought, perhaps, to add a few more complicated analogies, as those which lead to symbolizing the different phases of human life by the growth of a tree, the generative forces of nature by phallic emblems, the divine triads by an equilateral triangle or, in general, by any triple combination the members of which are equal, and the four principal directions of space by a cross. How many theories have been built up on the presence of the cross as an object of veneration among nearly all the peoples of the Old and New Worlds! Roman Catholic writers have justly protested, in recent years, against attributing a pagan origin to the cross of the Christians because there were cruciform signs in the symbolism of religions anterior to Christianity. It is also right by the same reason to refuse to accept the attempts to seek for infiltrations of Christianity in foreign religions because they also possess the sign of redemption.

When the Spaniards seized Central America, they found in the native temples crosses which passed for the symbol sometimes of a deity at once terrible and beneficent, Tlaloc; at other times of a civilizing hero, white and bearded, Quetzacoatl, who, according to the tradition, came from the East. They concluded that the cross had been brought to the Toltecs by Christian missionaries of whom the trace had been lost; and, as there must always be some known name to a legend, they gave the honor to St. Thomas, the legendary apostle of all the Indies. Although there were men to defend this theory in the last Congress of Americanists, it may be regarded as definitely rejected. It is now established that the pre-Columbian cross is a wind-rose representing the four princi-

pal directions from which rain comes, and is thus the symbol of the god dispenser of the celestial waters. If the Toltec cross could be related with a similar figure of the Old World, it would rather be the cross of ancient Mesopotamia—where that sign was also adopted to symbolize the four directions of space, and by extension the sky, or the god of the sky, Anou. But it would have to be established first that direct or indirect relations could have existed between the religious art of Mesopotamia and that of ancient America. To remove this hypothesis—even if we refuse to admit the development of a pre-Columbian civilization—it is only necessary to reflect upon the number of centuries that separate the American races from the great empires of the Euphrates and the Tigris. It would be wiser to see in the coincidence the simple result of two courses of reasoning identical in their simplicity.

On the other hand, we can not contest the facility with which symbols have been transmitted. Current products of industry, favorite themes of artists, they have passed continually from one country to another with articles of exchange and objects of adornment: witness the specimens of Hindoo, Chinese, and Japanese symbolical works and iconography which have come to us with the potteries, ivories, cloths, and all the curiosities of the extreme East. Soldiers, sailors, and travelers of every profession in former days could not start on a journey without taking in some form or another their symbols and gods, of which they carried the knowledge to a distance, bringing back in return those of the foreigner. Slavery would likewise favor the importation of symbols by the intervention of innumerable captives whom the fortunes of war or the hazards of piracy brought and caused to flow in from the most distant regions without taking away from them the remembrance of their gods or their worship. Coins, also, have never been wanting to carry to enormous distances the symbols of the nations which issued them: Gallic pieces are only counterparts of the Greek coinage of Philip and Alexander; and pieces rudely imitating Bactrian money have been found in the tumuli of Scandinavia.

Nothing, except perhaps a superstition, is as contagious as a symbol; much more contageous should both be when they are united—as they usually were with the people of antiquity, who seldom adopted a symbol without attaching to it the value of a talisman. Even now there are tourists who come back from Naples with a coral charm hung, according to their sex, from the bracelet or the watch-chain. Do they really believe that they find a defence against the evil eye in this Italian survival of an ancient Chaldean symbol? To many among them it is certainly only a local curiosity, a souvenir; but there are some in the number who

allow themselves to be influenced, unconsciously perhaps, by the Neapolitan superstition. "It can do no harm, and may do some good," they might be tempted to reply to you, as some gamblers do when you jest with them concerning their fetiches. This kind of reasoning is quite general among polytheistic populations, where every one thinks it good to do homage to other peoples' gods, and to unknown gods as well as his own; for who knows which one he may not need in this world or the next? Egyptian scarabs are found by the thousand, from Mesopotamia to Sardinia, wherever the armies of the Pharaohs or Phœnician ships have gone. Everywhere, also, in these regions, native scarabs have been collected, made in imitation of those of Egypt, and reproducing with greater or less exactness the symbols which the engravers of the valley of the Nile lavished upon the faces of their amulets. So also, long before the diffusion of coins, pottery, and jewels, the figurines of Greece and Etruria furnished all central and western Europe with divine types and symbolical images.

Are there any indications that permit us to distinguish whether like symbols have been engendered separately or are derived from the same source? The complexity and oddness of the forms, when they exceed certain limits, go to sustain the second of these hypotheses. The double-headed eagle of the old German Empire has now passed into the arms of Austria and Russia. The Englishmen Barthe and Hamilton were surprised when, traveling in Asia Minor some fifty years ago, they discovered a two-headed eagle of the same pattern engraved among religious scenes in the bas-reliefs of Pteria, which went back to the ancient Hittites. It is hard to suppose that a representation identical in features, so contrary to the laws of nature, was spontaneously imagined in both instances. M. Longperier furnished a solution to the riddle when he pointed out that the two-headed eagle did not replace the one-headed eagle on the arms of the empire till after the expedition of Frederick II to the East; that it figured at the beginning of the thirteenth century on the coins and banners of the Turkoman princes, then masters of Asia Minor. The latter adopted it as the symbol of all power, perhaps to figure the *hamca*, the fabulous bird of the Mussulman traditions, which carries off buffaloes and elephants as the kite carries off mice. Thus the Turkish race, M. Perrot observes, saw the entrance to the West closed at Lepanto and Belgrade by the eagle which had led it triumphantly on the banks of the Euphrates, and the image of which it also had borrowed from the sculptures cut by its predecessors on the rocks of Eniuk and Jasilikaïa.

If sufficient indications can not be drawn from the form, identity of signification and use may give strong presumptions respecting the affiliation of symbols. It is not surprising that the Hindoos

and Egyptians should both have adopted as the symbol of the sun the lotus-flower, which opens its petals to the dawn and infolds them on the approach of night, and which seems to be born of itself on the surface of the still waters. But the hypothesis of a borrowing becomes much more probable when, in the iconography of both peoples, we see the flower at once serving as a support to the solar gods—as Horus or Vishnu—and figuring in the hands of the goddesses associated with those gods—Hathor or Lakshmi, the Venuses of Egypt and India. The probability at last changes into a half-certainty when we find the lotus employed on both sides to render the same shade of thought in the rather indirect applications of solar symbolism. With either, the plant represents less the sun itself than the solar matrix, the mysterious sanctuary to which the sun retires every night to draw from it a new life.

We do not know and shall probably never know how the first communications of ideas were made between Egypt and India. But we can, by comparing monuments, discover some of the intermediate steps of the route which the symbolism of the lotus followed toward the East. Thus, in the sculptures of Phœnicia we find goddesses holding lotus-cups in their hands, and in the Persian bas-relief of Tak-i-Bustan the solar god Mithra is seated on the opened flower of the plant. Among the Mesopotamians and the Persians it is not rare to see this flower adorning tall trees, in which it is easy to recognize the sacred tree of the Semites or the Iranian tree that secretes the liquor of immortality. On a *patera* of Phœnician workmanship, found at Anathontis, the flowers of the lotus, borne by these conventional trees, are gathered in one hand by persons clothed in the Assyrian style, holding a key of life in the other hand. While the rosy lotus of the Egyptian monuments does not now grow wild anywhere in the valley of the Nile, it is, by a curious coincidence, preserved in the flora as well as in the symbolism of India.

One of the most frequent forms of the cross is called the gamma cross, because its four arms are bent at a right angle so as to form a figure like that of four Greek gammas turned in the same direction and joined at the base. We meet it among all the peoples of the Old World, from Japan to Iceland, and it is found in the two Americas. There is nothing to prevent us from supposing that in the first instance it was spontaneously conceived everywhere, like the equilateral crosses, circles, triangles, chevrons, and other geometrical ornaments so frequent in primitive decoration. But when we see it, at least among the peoples of the Old Continent, invariably passing for a talisman, appearing in the funeral scenes or on the tombstones of Greece, Scandinavia, Numidia, and Thibet, and adorning the breasts of divine personages—of Apollo and Buddha—without forgetting certain representations of the

Good Shepherd in the Catacombs, we can not escape the conviction that, in significance if not in form, it proceeds from a single source. This assertion seems to be confirmed in the class of monuments in which it is met. It appears, in fact, from prehistoric times among the people originating in the basin of the Danube, who colonized on either hand the shores of the Troad and of northern Italy; thence it extends, with the products of that ancient civilization, on one side to the Greeks, Etruscans, Latins, Gauls, Germans, Bretons, and Scandinavians, and on the other side to Asia Minor, the Caucasus, Persia, India, and finally to China and Japan.

It is not always necessary, for two figures to have the same origin, that they should have the same primitive signification. Sometimes it happens that a symbol changes its meaning in changing its country. It may possibly preserve only a general value as a talisman or amulet, like those crucifixes, degraded into fetiches, which are the only vestiges of the Christianity left among certain tribes of the Congo by the Portuguese domination of the last century. Sometimes, again—especially in the case of an image proper—its new possessors will seek to explain it to themselves by some more or less ingenious interpretation, and will thus restore to it a symbolical bearing, although by means of a new conception. The rising sun has often been compared to a newborn child. The comparison led the Egyptians to represent Horus as a child sucking its finger. The Greeks fancied that he was putting his finger to his lips to admonish the initiated to be discreet, and made of the representation a figure of Harpocrates, the god of silence.

Such changes of sense may also be reconciled with knowledge of the primitive significance. It is a pleasant thing to find everywhere the image or idea we are fond of. The Neo-Platonists believed in good faith that they could distinguish representations of their own doctrines in the symbols as well as in the myths of all the contemporary religions. The early Christians saw a cross in every figure that presented an intersection of lines—in the anchor, the mast and its yard, the standard, the plow, the man swimming, the bird flying, the praying man with outstretched arms, the paschal lamb on the spit, and the human face, where the line of the nose is crossed by that of the eyes. When the Serapeum at Alexandria was demolished, the Christian authors of the time related that a number of ansated crosses were found. They themselves observed that the figures were the same as the ancient Egyptian symbol of life, but that did not keep them from seeing in them a prophetic allusion to the sign of the redemption. Sozomenus adds that the fact provoked numerous conversions among the pagans.

It may also happen that the significance of a foreign symbol is knowingly modified, in order to adapt it to an idea or a faith previously destitute of all material expression or restricted to a few rudimentary representations. When the Persians had possessed themselves of Mesopotamia, they appropriated to themselves nearly all the imagery of the conquerors, in order to give form to their own religious conceptions, which the absence of a national art had left without any well-defined plastic representations. So, when the Christians began to reproduce on the walls of the Catacombs the scenes of the Old Testament and the parables of the New, they borrowed their primary models from classical and mythological art. Mercury Criophorus furnished the type of the Good Shepherd. Orpheus taming the wild beasts became a symbol of Christ and his preaching. The Christian holding to a cross to overcome temptation was represented by Ulysses tied to the mast of his ship, in order to resist the songs of the sirens. By an ingenious application of a myth which paganism has already spiritualized, Psyche offered the figure of a human soul to Love, whose place was taken by an angel. The religions of Gaul and India furnished examples of like assimilations from the time they came in contact with the symbolism of more advanced nations.—*Translated for the Popular Science Monthly from the Revue des Deux Mondes.*

CAN THE MOSQUITO PEST BE MITIGATED?*

THE annoyances caused by flies and mosquitoes have invited the special attention of Dr. Robert H. Lamborn, and prompted him to efforts to secure such study of their life histories and of their natural enemies as might lead to the discovery of some practicable means of mitigating their depredations. In 1889 he addressed a circular letter to the working entomologists of the country, offering prizes for essays containing original investigations regarding methods of destroying these pests. He had especially in view the utilization of the dragon-fly—a harmless insect, but at the same time exceedingly voracious and very fond of mosquitoes—and the possibility of propagating it artificially in places where mosquitoes abound. The results of the correspondence he had on the subject are published in this interesting book of studies, which, while it fails to verify the hopes which Dr. Lamborn entertained respecting the dragon-flies, does not fail but is encouragingly successful in pointing out some methods of considerable

* Dragon-Flies vs. Mosquitoes. Studies in the Life History of Irritating Insects, their Natural Enemies and Artificial Checks. By Working Entomologists. With an Introduction by Robert H. Lamborn, Ph. D. New York: D. Appleton & Co., 1890.

probable efficiency for reducing the numbers of the hosts of these enemies of mankind. The prizes were awarded by a committee consisting of Drs. H. C. McCook and J. S. Newberry—the first prize to Mrs. Eugene Aaron, of Philadelphia, for an essay on The Dipterous Enemies of Man; and the second prize equally divided between Messrs. Archibald C. Weeks and William Beutenmuller, of New York, for papers on The Utility of Dragon-Flies as Destroyers of Mosquitoes and on the Destruction of the Mosquito. These, with other contributed papers, are embodied in the volume. From Mrs. Aaron's essay we learn that the *Culicidæ*, or mosquitoes, breed in stagnant water, and have been observed living, in all stages of growth, in the most insignificant puddles—as "in a puddle of water, eight inches square and one inch deep, made by the rain in an iron pulley in a foundry-yard. They are also to be observed teeming to overcrowding in the hoof-holes in boggy cow-pastures. But the shallows occasionally overflowed and replenished by rivulets in swamps, the stagnant pools formed by ditches without outlets, and the vastly more numerous murky pools made by the joining of tufts of grass in marshes, are the usual breeding-places in the rural districts. In village and urban localities rain-tanks, undrained gutters, badly paved, damp by-ways, and garden ditches are the most fruitful places for recruiting their numbers. These surroundings are selected by the female with a view to the fact that from three to four weeks will be required to perfect the changes from the egg to the imago; and they must be situated so as to receive sufficient water from rain or outside overflow to replenish the evaporation or soaking into the ground. In this selection the female shows the usual instinct which is so noticeable in insect economies." When hatched, they hug the sides of pools and shallow margins, and, spending most of the time at the surface with the orifice of the air-tube just in contact with the air, are not usually found at great depths. They are easily frightened by any stir or motion from above, but pay little attention to any dangers that may menace them from the water. Very little is known of their feeding habits; but the statement that they are scavengers, feeding on decaying substances in stagnant water, has not been confirmed or disproved. They have been observed to feed on minute animals, and to destroy young trout. They go through several transformations, and reach a curious shape in the pupa, which—the head, thorax, legs, and wings, all being folded in one mass, and the abdominal segments being left free for the purpose of navigation—has a top-heavy and clumsy appearance, although it is quite as active as the larva. After the insect has matured and has begun its flight, the principal objects in its remaining brief existence "are the search for the desired mate and the duties of

reproduction. To suppose that the tormenting of man occupies any considerable time in the mosquito economy is certainly a mistake. It is only the female which can thus make our lives miserable." They are local in their range, and the supposition that they can be carried long distances by the wind is declared a mistake. House-flies are omnipresent with us, while mosquitoes appear only in spots. According to Packard, "fresh horse-manure, with plenty of heat and moisture, furnishes the best food for the young maggot. From a hundred to a hundred and fifty eggs are deposited in irregular, loose sacs, usually within eighteen hours, and hatching in twenty-four hours or less. The maggots molt twice; the three stages of larval development being of the following periods: first stage, one day; second stage, from twenty-four to thirty-six hours; third stage, three or four days. To this maximum period of seven days is to be added the same length of time for the pupal life; thus it will be seen that fifteen or sixteen days are required for the entire development from egg to imago."

The expediency of trying to exterminate them is more than doubtful, for, according to the same author, "it should be remembered that flies have an infancy as maggots, and the loathsome life they lead as scavengers cleanses and purifies the August air, and lowers the death-rate of our cities and towns. Thus the young of the house-fly, the flesh-fly, and the blow-fly, with their thousand allies, are doing something toward purifying the pestilential air and averting the summer brood of cholera, diphtheria, and typhoid fevers which descend like harpies upon the towns and cities. It is a useful species, to which man owes more than he can readily estimate, and with which he can dispense only when the health of our cities and towns is looked after with greater vigilance and intelligence than is perhaps likely to be the case for several centuries to come."

Mosquitoes, therefore, are entitled to exclusive attention in the exterminating effort.

Mrs. Aaron has a poor opinion of the efficiency of the dragon-flies, or *Odonats*, as mosquito-destroyers. They become rarer about the time that the mosquitoes are most numerous. In the matter of flight they are very local, and it seems impossible to conceive that they could ever be brought to frequent deep woods or city streets where mosquitoes abound. The author's observations of their feeding habits lead her to believe that they prefer robust, meaty insects, and that studies of their appetites in confinement are misleading. The habit of migration among them will also militate against their efficiency as mosquito-destroyers.

Other writers find that they are capable, in natural conditions, of working great havoc among mosquitoes, but doubt the utility of efforts to improve on nature in the matter. Captain C. B. N.

Macauley, U. S. Army, relates that, in a mosquito-infested region of Montana, he was told how the mosquitoes had disappeared, as if by magic, on the sudden appearance of a brood of devil's-darning-needles or dragon-flies of rather large size. The agency of this insect in the matter was corroborated by the evidence of squaw-men and Indian traders, who said that the flies did not appear every mosquito year, but, when they did, they came in droves and cleared the mosquitoes out. They were called "mosquito-hawks." The captain himself afterward had an opportunity of observing them at work, and to determine that they were dragon-flies. "I noticed," he says, "that they flew in an irregular kind of skirmish-line, moved slowly, and every now and then made what he described as short 'dabs' at apparently nothing. Mr. Heistand said that 'each one of these dabs means a mosquito.' I was curious to see how deliberate they were about it, and how fairly aligned the skirmish-line was. They appeared somewhere about 11 A. M., and when I went into the post later I crossed the parade-ground and saw detachments of about half a dozen flying slowly about. They stayed at about an average of three feet from the ground. I do not know how late they kept it up or how early they began. They stayed until all the mosquitoes appeared to be gone." Dr. Lamborn also tells how his own attention was drawn to the subject. It was while he was in the forests of Lake Superior, railroad-building. "Sitting in camp while supper was being prepared, I often, with a sentiment of gratitude, looked through my mosquito-veil at the dragon-flies that collected in the open spaces among the pine-trees. They darted from side to side like swallows in a meadow, but with amazing rapidity, and at every turn, the natives assured me, 'a mosquito ceased from troubling.' Afterward I happened to observe an entomologist feeding a dragon-fly that had eaten thirty house-flies in rapid succession without lessening his voracity. What thought could be more natural than the one that came to me, that an artificial multiplication of dragon-flies might accomplish a mitigation of the mosquito pest?"

Mr. Beutenmuller, of the Museum of Natural History, New York, avers that "the dragon-flies (*Odonata*), especially the *Æschinus*, *Gomphina*, and *Libellulina*, are the natural enemies of the mosquitoes; they are voracious—they sometimes appear in great numbers, and, as a matter of fact, the mosquito disappears before them, while their breeding-grounds are, in many respects, similar, so far as fresh and brackish water habitats are concerned; and, finally, in the metamorphosis of the dragon-fly we meet conditions which introduce it in antagonism to the mosquito at the same stages of development." The dragon-fly, however, prefers sunlit areas, and will not live in the woods.

These are the conditions in nature. But the attempts to subject dragon-fly life to the rules of art do not appear to have been successful. Mr. Weeks tried earnestly and most intelligently to raise the insects artificially on his father's farm on Long Island and in his house in Brooklyn, and failed to obtain any results worth boasting about. He finds that they are diurnal, working in the sun, and never present at night, when the mosquitoes are busiest; that they are short-lived, and frequently destroyed in large numbers by heavy showers and winds; that, with few exceptions, they confine themselves to the vicinity of their place of birth, and, if removed therefrom, quickly return—hence, can not be colonized; and he concludes that "an attempt to destroy flies and mosquitoes by the artificial propagation of dragon-flies or any other insect would be unprofitable, unadvisable, and impracticable."

Mr. Beutenmuller thinks that positive statements can not yet be made respecting the expediency of artificially breeding dragon-flies for use against the mosquito. Differences in the habits of the two insects are against the scheme. Dragon-flies seek open places and the sun, while the mosquito finds hiding-places in the woods and in tall grass. "Under these circumstances the dragon-fly will not find its prey. Great numbers will escape; only those encountered in its busy flight through the air will be captured, for the dragon-fly does not hunt for its booty nor scour the forbidden shadows of woods and forests, and at nightfall the mosquito will elude his pursuer and rise to his murderous intent." But the dragon-fly "may, in some genial locations, suit the elements of the question and be of practical service; it may, indeed, be more widely beneficial than we suspect."

Of other means of keeping down mosquitoes, Mrs. Aaron recommends flushing the breeding-places with water, draining swamps, creating active artificial currents, encouraging fish, and spraying their hiding-places with petroleum. Mr. Weeks has faith in the enforcement and observance of sanitary laws and the encouragement of birds. Mr. Beutenmuller advises the use of lanterns so arranged as to attract and destroy the mosquitoes, with pans of kerosene or other strong mixtures for their destruction, which may be placed around houses and hotels and in marshes, general and scientific drainage of swamps; encouragement of fish and waterfowl; and, where the conditions are favorable, the use of coal-oil in the waters of estuaries of rivers and on the rain-invaded areas of deep woods for destruction in the larval stages. Astringents, like logwood or alum, will also prevent the growth of the mosquito in its incipient stages. Dr. H. C. McCook thinks it might be well to call spiders into service.

The most generally effective of these remedies seem apparently to the authors in the book to be petroleum spraying and draining. A very little petroleum, spreading itself in a minute film over the water surface, will go a great way in destroying the larvæ. Drainage also promises to be very efficient. "It goes even farther back than the larval stage, for it precludes the incipient acts of the mosquito at propagation. It robs her of the congenial *nidus* for the development of her eggs." The question can, however, only be satisfactorily settled by a concerted movement over wide tracts of land. "The arrest of the plague in one portion of the country when the next section makes no effort to suppress its own contingent can only lead to discouragement and ridicule." Against the house-fly the most promising measure of offense is the encouragement of the fungus that destroys it, which is identical with the yeast-plant; but, as flies seem to do as much good as harm, it will probably be wisest to leave them alone.

SLAVONIAN FAIRIES.

By Dr. FRIEDRICH S. KRAUS.

IN my studies in South-Slavic folk-lore, I have frequently come in contact with the Vila superstition, but only recently under conditions in which I could make a full investigation of it. The native literature on the subject is immense, but so confused and indefinite that an adequate examination of it would constitute a very serious task. The only way to obtain a satisfactory degree of knowledge in the matter seemed to be to sojourn at places where the population was relatively pure, and become acquainted with the living beliefs of the people. This I have done, having resided at five places, and searched out their popular traditions as one would suck an orange. Especially with regard to the Vilas have I got enough to make a book; I shall here give only a short chapter from it, including a part of what I learned in the single village of Pleternica. This village lies at the foot of a mountain on the right bank of the Orliava River, about three hours from Brod on the Bosnian frontier. The present village is not more than one hundred and thirty years old. In it the estates lie scattered among the hills, each on an elevation by itself, and each a fortified post. The people are engaged in farming, herding, and robbery. The practice of robbery is an inheritance from Turkish times. A large part of the population, who had been Mohammedan, had embraced Roman Catholicism in order to keep their property. Some of the families still boast their Mohammedan extraction. Many Catholics have recently come into the

place from Bosnia, and it has about fifteen hundred inhabitants. The people can all read and write, are neat, enterprising, industrious, and well off; but, notwithstanding their good schools, they stick to their old, pre-Christian superstitions.

The Vilas, which occupy the greatest space in the popular lore, are female beings of the same kind as the fairies or wood-nymphs of the Germanic nations. The etymology of the name is uncertain, but it is supposed to mean "rustic"; and the Vilas are therefore spirits of the wood. The belief in them controls all the incidents of the peasant's life. The spirits are supposed to appear rarely alone, but usually in companies of two, three, five, or seven. They are distinguished by an extraordinary, maidenly beauty, clear complexion, slender stature, and dark, wavy hair descending to the ankles. They move lightly and freely through the air, being winged, although their wings are usually invisible. They can also lay their wings aside. Their dress is simple, and includes a crown of pearls on the head inclasping the floating hair; a long white robe, such as is worn by the peasant women at their work, reaching to the ground, without any outer garment; and a girdle of red silk.

They enjoy everlasting youth, are acquainted with divination and healing, have access to all the treasures of the earth, and can at will produce love or hatred in the children of men. They are particularly friendly to deer, horses, sheep, and godly men. They can assume the form of the gray mountain wolf. Under some circumstances they are pettish, evil, and vengeful; they teach children to steal; but sometimes, out of pity, take forlorn orphans under their care. They prefer to live upon or in trees, especially favoring the linden and nut trees; travel in the clouds or in whirlwinds; dance on hillocks, in green fields at springs, on roofs, and under isolated trees, accompanying the exercise with songs, and are distinguished by a clear, penetrating cry.

Their ordinary occupations are milking does, combing their hair with golden combs, washing their robes, and bathing in clear streams under the shadows of the overhanging trees. If a person wants to see Vilas or enjoy their presence, he must, if he is not gifted with the second-sight, put on his clothes wrong-side out. Children born on Tuesday or Sunday have the second-sight; but the Vilas never show themselves to children born on Friday or to red-haired men. Really faithful and Vila-fearing men carefully avoid speaking their name. They say "she," "that one," or, in case of more than one—two, for example—"those two."

The Vilas are supposed to be voluptuous creatures, and to lead lives that would not be regarded, according to our views, as moral. They bear only female children, which take after the mother. Whoever has enjoyed their favors can never afterward love a

mortal woman. But one can rarely count on the endurance of their love, or be happy with it, and at last the chosen one will try to escape them. They are also sometimes accustomed to take men into their society; but one who has once associated with them, willingly or unwillingly, can never get rid of them, and must at last pay for his mistake with his life. He is strangled or torn to pieces, or, if a lighter punishment is administered, he is made blind or lame. The Vilas are able to call back to life men that they have slain, and also to lift the disabilities they may have inflicted upon any one. If a man succeeds in robbing a Vila of her wings, he acquires full power over her. If she loses her crown and her robe, she only suffers a separation of some time from the society of her playmates.

Three stories that were told me give some insight into the customs of the Vilas. As the peasant Adam Odvorcie was driving along, he came to a hill where seven Vilas were dancing. As he drove by, they came down and frightened the horses so that they ran away, leaving him in the road. He waited till the Vilas went away. A little farther along he saw seven of them washing their clothes. Reza Barjanovie relates that, in the summer of 1887, as she was sitting under a nut-tree in the yard with her mother-in-law, they heard dancing and singing on the hill back of the house. All at once there arose a whirlwind and drove through the yard, striking them forcibly. They were much frightened, and, while trying to consult as to what had best be done, the mother-in-law, accidentally looking up at the roof, exclaimed: "Look! there are Vilas up there!" She said again to Theresa: "Look, daughter! the Vilas are dancing on our roof!" At that moment the Vilas disappeared. Both women have the second-sight. They often go to the woods in the morning and have opportunities to see much that is uncanny.

Koprivce Vic, an octogenarian of Pleternica, wrote me on the 25th of April, 1887, in his own handwriting, of the following adventure he had had with the Vilas: "Several years ago, in the old times, I was going into the mountains with my grandfather. It was late in the fall, and I was helping him drive the oxen through the plum orchard to the pasture. We perceived *them* away off, stamping with stamps, washing *their* robes. The nearer we came to *them* the more distinct grew the stamping. We were about to turn back, but took heart and went to within a few yards of *them*. Two of *them* were washing robes. We saluted *them* in the name of God. *The two* rose, threw their stamps over their backs, and let their hair fall to the ground. When we had gone a little farther, one said to the other, 'What shall we do to them?' Said the other, 'Nothing, for they saluted us in the name of God, and we shall have to let them go.' Upon this we

returned to the orchard and lay down under a plum-tree. Grandfather fell into a sleep, and *it* took him by the hair and began to beat his head against the tree. We jumped up forthwith and ran into the cellar."

The truest and firmest friendships for mutual help in peace or suffering are concluded among the South-Slavic peasantry by the confirmation of an elect brotherhood or sisterhood. Obviously a connection of that kind with such powerful beings as the Vilas must be considered exceedingly precious. In the *sagas* and heroic songs of the people every great champion has a sworn sister among them. How such privileges are obtained was as unknown to me as to every other writer on the subject, for the people, if they know, will not willingly give up such a secret to every questioner; but Mother Eve, of Pleternica, who keeps all these traditions of the past living in her mind down to the present day, told it all to me. The fact that it is so fresh in her recollection is evidence that the cult still exists. The time of the telling was February 28, 1888.

If a person wishes to contract this relationship, he must take a horse's hoof, a piece of skin cut from under the hoof, and two or three hairs from the mane, the tail, and the head of the horse. He must also take a new broom that has never been swept with, and the price of which he has not beaten down in buying, and must provide himself with some horse-dung. Then, on the first Sunday in the new moon, he must go into the yard, sweep a circle around himself, and in the middle of the circle put the hoof and the other things he has taken from the horse, and, standing with the right foot on the hoof, with both hands brought together by the palms, call three times between the hands, three times turn around with the hoof, and utter the formula: "Sister Vila! I seek you over nine fields, nine meadows, nine brooks, nine woods, nine hills, nine mountain-peaks, nine ruined towers! Come to me and let me swear brotherhood with you!"

When the Vila appears, the person performing the conjuration says: "Sister Vila! I have found you now, and am your chosen brother!"

The conjuring person again blows three times through his closed hands and continues: "Sister Vila! give me your help whenever I call upon you, and help those whom I would help."

He must next name the person whom he holds dearest in life: if a man, the maiden of his choice; if a woman, the man. After which he adds: "Sister Vila! I conjure you by the living God and the sister Vilas that I may have what is mine from the beginning of the world." The rising sun is meant by "the living God."

By contracting this relationship one may assure himself of

the assistance of the Vilas, and may also become more or less of their kind and acquire various arts from them. Men thus sometimes obtain the mystic power of changing themselves at pleasure into an animal, as a horse or a wolf, and of doing much mischief. Wizards and medical practitioners, men and women, boast of their relationship and ascribe their skill to it. A dwarfish herdsman, about forty years old, living in a cave in Odvorci, is distinguished as a cheiromancist, and can tell from the lines of the hand what herbs are good for a patient. He asserts that the Vilas had him under instruction for seven years. A *Bracara* lives at Petersdorf, to whom suffering Mohammedans come from Bosnia and pay two golden ducats for a cure. He gets such prices because he professes to be able in serious cases to hold consultations with the Vilas.

Toma Miemkovic, of Pleternica, told me the following story of a woman changing into a wolf, vouching for its truth, because, as he pretended, he had himself seen the person in question. There lived a very rich man at Trapari, who possessed a great flock of sheep, over which he put two shepherds and six dogs. Every day a wolf appeared, ate up a sheep, and vanished, without any one being able to see it. The overseer raged, and the sheep kept disappearing till three fourths of them were gone. At last he became desperate, when he was told by some one that there was no real wolf, and was advised to get up early in the morning, put on all his clothes, from his shoes to his cap, wrong-side out, drive the sheep to the brook in the pasture, climb a tree and wait; by means of which he would be able to find out who the wolf was. He followed this counsel. About noon an old woman of the neighborhood came down with a pail on her head and drew water from the brook. Then she lay on the grass, turned three somersaults, changed into a wolf, seized the fattest wether—a four-year-old—and ate him, wool, entrails, hoofs, and all. The man was on the point of shooting her from the tree, but, as he knew her, thought it better to punish her well at home. After the wolf had eaten the sheep, it executed three more somersaults and turned back into the old woman. The overseer came down from the tree and chastised her well; and, when her sons heard what she had been doing, they cudgeled her so thoroughly that she could hardly bear to have anything touch her. From that time on she never changed into a wolf, or ate any more strange sheep.

The womanly nature of the Vilas appears in their insatiable revenge for scorn of their love. The following story corresponds with the legend of the youth who knew no fear. The outcome in the present case is the discomfiture of the rash man; for, instead of the usual ghost, Vilas appear as the spirits of revenge.

There was once a Magyar who was so handsome that one could

hardly admire him enough. The Vilas took him away and taught him for twelve years to dance, but he would not and could not learn. On the first day of the thirteenth year, about eleven o'clock in the morning, he escaped from them, took refuge in a wood, and hid in a large, hollow oak-tree. About eleven o'clock at night the Vilas came up to him like clouds, and tried to get him away. They called to him: "Come, love, to us; don't be afraid." But he would not answer. At daybreak he started again on his road, and came to a pasture where some herdsmen were watching swine. He asked them to protect him. They gave him something to eat and drink. He lay down, and they posted themselves in a circle around him. The Vilas came again about midnight and asked him to go with them, but he refused. In the morning he paid the herdsmen well for their care, went on, came to an inn, and asked for a lodging. The landlord answered that he could not accommodate him, for he had only one chamber, which no one dared to sleep in, for whoever spent a night in it never lived to see another day. The Magyar replied: "I am not afraid; only give me enough smoking-tobacco, candles, a table, a chair, and a bundle of kindling-wood. You need not trouble yourself about me." He lit the candles, sat down, and went to smoking. The Vilas came about ten o'clock, alarming the whole house, and cried to him, "Ah, now we have caught you!" and they carried him off and made a male Vila of him.

The dances, to which persons allied by sworn brotherhood are admitted, take place in the night-time. The participants must not talk of the matter, under penalty of death. The Podborje Hill, at the baths of Daruvar, at the foot of which is a church of the old believers, was recognized some thirty years ago as a place where such dances were held.

A young woman of fifteen, in Drenovci, was accustomed to go out every night, as soon as her husband was asleep, and soar around with the Vilas. On one of these occasions the husband awoke, and, not finding his wife at his side, remained awake till she came back at dawn. In the morning he asked her if she had slept well. She said no, she had had a restless night. The next evening she went out again with the Vilas. The husband lay awake, and on her return at dawn asked her where she had been. She made no answer, but was found dead in the morning.

Whatever once comes into the possession of the Vilas is lost to men; and if a man gives an unsuitable thing to them, he will have to suffer for it. A peasant girl told my mother that, when her little Catherine was fretful and could not sleep, she took her in the evening, when the cattle were coming home, into the front yard, gave her a swing, and said, "God and the Virgin help us. The Vila marries their son and invites Catherine to the wedding.

Catherine can not go, but sends her moaning there"; and the child would cease to fret.

The Vilas play a subordinate part in many other stories, and occasionally appear mixed up with religious ideas in such a way that a course of comparative studies would be necessary to make them clear.—*Translated for the Popular Science Monthly from Das Ausland.*

SKETCH OF THOMAS CORWIN MENDENHALL.

By GEORGE ILES.

AMERICA is rich in men who have proved how much more decisive in a career of usefulness is nature than nurture, the instinct for acquiring knowledge than facilities for instruction, a worthy ambition to render service to one's fellows than all the means and agencies which wait upon circumstances ordinarily and often ignorantly called favorable. Such a man is the subject of this sketch.

THOMAS CORWIN MENDENHALL was born on October 4, 1841, near Hanoverton, Ohio. On his father's side he is of Quaker stock, tracing his descent from Benjamin Mendenhall, who emigrated from Wiltshire, England, with William Penn, and settled in Delaware County, Pennsylvania. Young Mendenhall's schooling was of the scanty kind afforded by small country villages more than a generation ago; defective though it was, it developed in him at an early age a fondness for the study of mathematics and the natural sciences. He gradually won for himself an education which his opportunities would have denied to a less sturdy spirit.

Among the most important influences working for his mental development in boyhood was the encouragement of his father, who, while he had enjoyed only limited opportunities for educational training, was an earnest, thoughtful man, and fond of reading. From him, along with the conviction that there must be an antecedent cause for every effect, he derived a disposition to investigate causes and inquire after reasons. Another impulse, which must have had a very considerable effect upon the determination of his future career, was given him by one of his teachers in the old log school-house—a good Quaker lady, who had a way of setting her pupils to making simple experiments, and thus, as he has said to us, directed the first physical laboratory that he ever entered. She taught him that a ray of light was bent in passing from one medium to another of different density, by means of the old and familiar experiment with the coin and tin cup. On another occasion, by darkening the windows, except for a small opening in the

corner of one of them, with the shawls of the girls, she showed how an image of the big boys jumping from a "spring-board" outside was projected on the roughly plastered ceiling. Such experiments and illustrations made a great impression on him, as they undoubtedly did on his fellow-students, and, we may assume, produced lasting influences that varied in each according to the bent of his mind. Young Mendenhall read also with great eagerness the small volume of Comstock's Natural Philosophy which fell into his hands about this time, and was allowed to draw the cuts of levers, pulleys, etc., on the blackboard at school. He experimented on the law of the lever when, with the other boy who had been detailed with him for the duty, bringing water from a distant spring to the school-house, the pail was carried between the two on a stick. He had a taste for mechanical operations and was something of an inventor, and was especially fond of mathematical studies. Of the few books in the small family library Chambers's Information for the People was his favorite, and he read and reread it till he nearly knew it by heart. In astronomy he made his first observation by means of a semicircle of wood which he had roughly graduated and mounted in the meridian, and on which the line of collimation was determined by two pins at the extremities of the diameter. When about eleven years old he made an unsuccessful trial of Foucault's experiment to prove the rotation of the earth, of which he had read in a newspaper. When it became necessary for him, at an early age, to care for himself, he continued his studies at odd times as he found opportunity, still attending school as regularly as he could. Rainy days on the farm were eagerly made use of for reading and study. Studies in algebra were carried on while he was employed in a saw-mill, and the problems were worked out on loose boards with chalk. "More than to all other sources, however," Prof. Mendenhall remarked, "I am indebted to the friendly advice, encouragement, and assistance of teachers and others with whom I came in contact. To be made to think that I could do something or had done something by a word of kindness or congratulation was to be helped along immensely."

Remembering the waste of time, the discouraging, because useless, difficulties of his youthful struggle, Prof. Mendenhall has ever been a faithful advocate of bringing the highest education and the best scientific culture within the reach of every seeker of it. His proficiency in science soon developed itself in the perfect form needful to one who would successfully teach. In 1873, on the organization of the Ohio State University, he was elected to the chair of Physics and Mechanics, which he held until 1878, when he accepted the professorship of Physics in the Imperial University of Japan at Tokio. While in Japan he organized a

special course in physics, and established a physical laboratory in connection with the science department of the university. In addition he founded a meteorological observatory, which after his departure was merged into the general meteorological system established by the Japanese Government. Prof. Mendenhall furthermore carried out an investigation on the force of gravity at the sea-level and on the famous Japanese extinct volcano Fujinoyama. His measurements of the figure of the mountain and of its density enabled him to deduce a value for the mass of the earth which agrees very closely with that of Francis Baily as obtained by the Cavendish method. About this time he also made a series of elaborate measurements of the wave-lengths of the principal Fraunhofer lines of the solar spectrum by means of a large spectrometer, then one of the best in existence. This work was done before Prof. Henry A. Rowland had produced his famous diffraction gratings, but some fine specimens of Lewis M. Rutherfurd's rulings were used. No precise measurements of these rulings were undertaken; hence Prof. Mendenhall's results were only valuable as ascertaining the relative spaces of the various portions of the spectrum; as such they rank among the best given to the world previous to the recent researches with gratings of accurately known and more minute division.

Japan is a land of frequent earthquakes, and Prof. Mendenhall soon became interested in studying their phenomena. That this study on his part and that of others might be systematic and co-operative, he aided in founding the Seismological Society of Tokio. While ardent in his university work and an unsparing toiler in diverse fields of original investigation, Prof. Mendenhall felt that he had a duty to men and women who could not enter his classes nor read the scientific memoirs he was writing. With Prof. Edward S. Morse, then in Japan, and others, he gave lectures on scientific themes to popular audiences in the temples and theatres of Tokio. So thoroughly was an intelligent curiosity thus aroused in the city, that soon a public lecture hall was established—the first in the Japanese Empire.

In 1881 Prof. Mendenhall returned to the United States and resumed his chair at the Ohio State University. In the following year he organized the Ohio State Weather Service, of which he was director until 1884. While holding this office he devised and put into operation a system of weather-signals for display upon railway trains. This system was generally adopted throughout the United States and Canada; in 1887 it was superseded by a new code introduced by the Chief Signal Officer. In the United States Signal Service at Washington Prof. Mendenhall received an appointment in 1884. Here he organized and equipped a physical laboratory in connection with the office of the Chief Signal Officer,

and inaugurated systematic observations of atmospheric electricity. One of the results of his work was proof that rain precipitation is the cause rather than the effect of electrical discharges in the atmosphere. He concurrently investigated the methods for ascertaining ground temperatures, inventing improved forms of apparatus. Pursuing a line of inquiry begun in Japan, he established the systematic gathering of data regarding earthquakes from stations scattered throughout the United States. Immediately after the earthquake of August 31, 1886, he visited Charleston, and made a report upon the agitation with a co-seismic chart showing the disturbed area. It seems probable that, before many years elapse, the phenomena of earthquakes will have sufficiently yielded their secrets to enable predictions of their occurrence to be made, following up and perfecting the methods by which the Weather Bureau now issues its forecasts. In this branch of science, as important as it is difficult, Prof. Mendenhall has done invaluable work as a pioneer. After two years' service of the Government, he resigned, to accept the presidency of the Rose Polytechnic Institute in Terre Haute, Indiana. His new responsibilities were discharged with marked success; he brought to them rare address, tact, and executive ability. The Institute, young as it was, soon had an assured place among the leading technical schools of the country. That it supplies an educational need in the flourishing city in which generosity has placed it came out plainly at its commencement exercises last year. On that occasion Prof. Mendenhall was able to say that every member of the graduating class had secured an engagement and was fairly launched upon his life-work.

In July, 1889, Prof. Mendenhall was nominated by the President to fill the superintendency of the United States Coast and Geodetic Survey, one of the most important scientific appointments in the country, and which has been held by men of the stamp of Alexander Dallas Bache, Benjamin Peirce, and Julius E. Hilgard. Prof. Mendenhall succeeds to their fame, but also to administrative duties which have grown more onerous with every year of the survey's history. He has nevertheless an opportunity for scientific work which his energetic and organizing mind is not likely to leave unimproved. His interest in the gravitation work which the survey has carried on for several years has led to the formation of new plans for its more rapid and vigorous prosecution. For some time past the survey has been engaged in the study of terrestrial magnetism; its researches in this direction are being actively pressed forward, one aim being to locate the north magnetic pole with precision. In geodesy the survey is steadily advancing the great transcontinental system of triangulation, and some new contributions of importance toward our knowledge of

the earth's figure are likely to be presented at an early day. As Superintendent of Weights and Measures, Prof. Mendenhall enters upon another field of duty for which his work in the past has been a preparation. He has long borne a prominent part among the teachers who have pressed and still continue to press the metric system upon the American public. He is an active member of the American Metrological Society, and has repeatedly, on the platform and through the press, taken occasion to impeach the current irrational medley of pounds avoirdupois and troy; of grains, gallons, feet, and bushels.

Prof. Mendenhall has uncommon gifts as a lecturer; his masterly expositions of physical themes continue to be given despite the pressure of official duties. At the Cooper Institute in New York, the Lowell Institute in Boston, the Peabody Institute in Baltimore, the Mechanics' Institute in Cincinnati, the Brooklyn Institute, and in other of the chief popular lyceums of the country, he has been greeted by large audiences. The honorary degree of Ph. D. was conferred on him by the Ohio State University in 1878, and that of LL. D. by the University of Michigan in 1887. In the latter year he was chosen a member of the National Academy of Sciences. He was elected a member of the American Association for the Advancement of Science at the Indianapolis meeting in 1871, and was advanced to the grade of Fellow in 1874. In 1882, at the Montreal meeting, he presided over the Section of Physics. His address on that occasion was a forcible plea for physics in education, presenting a judicious view of the value of guidance when students attempt original research. In 1888 he was chosen President of the Association, and in that capacity at last year's meeting, in Toronto, won golden opinions on all hands. At the approaching meeting in Indianapolis he will, it is understood, take for the theme of his address, as retiring president, The Relation of Science and Scientific Men to the General Public.

In 1887 he contributed the first volume to The Riverside Science Series, A Century of Electricity. A revised and enlarged edition of this capital popular treatise has been issued this year. From among his numerous contributions to scientific publications we select: On the time required to communicate impressions to the sensorium and the reverse, American Journal of Science, 1871; On the heaping of liquids, American Journal of Science, 1873; An improvement on Bunsen's method for specific gravity of gases, Proceedings of the American Association for the Advancement of Science, 1878; Temperature and index of refraction, American Journal of Science, 1876; Co-efficient of expansion of a diffraction grating, American Journal of Science, 1881; Memoirs of the Scientific Department of the University of Tokio, Ja-

pan: (1) Report on the meteorology of Tokio, 1879; (2) Report on the meteorology of Tokio, 1880; (3) Measurement of the force of gravity at Tokio and the summit of Fujinoyama, 1881; (4) Wave-length of some of the principal lines of the solar spectrum, 1881; The influence of time on the change in resistance of carbon under pressure, American Journal of Science, 1882; Differential resistance thermometer, American Journal of Science, 1885; Report on the Flood Rock explosion, Science, October 1885; On the electrical resistance of soft carbon under pressure, American Journal of Science, 1886; On characteristic curves of composition, read at the American Association for the Advancement of Science meeting, 1886, published in Science, March 1887; Seismoscopes and seismological investigations, read at the meeting of the National Academy of Sciences, 1887, published in American Journal of Science, 1888; On an improved form of quadrant electrometer, read at the meeting of the National Academy of Sciences, 1888; On the intensity of earthquakes, with approximate calculations of the energy involved, Proceedings of the American Association for the Advancement of Science, 1888; On globular lightning, American Meteorological Journal, 1890. A memoir of researches in atmospheric electricity, read before the National Academy of Sciences in 1888, is now in course of publication.

In the attempt to measure the duration of a flash of lightning, Mr. A. C. Raynard, in Knowledge, regards a recurrent flash as "a very complicated succession of discharges lasting for an appreciable part of a second. The giant discharges which take place during a storm, between irregularly shaped and badly conducting masses, differ materially in character from the flashes produced in a laboratory between good conductors. In the laboratory the whole flow takes place at once. In nature there seems to be a flow or rush succeeded by a dribble, which ceases or nearly ceases, and commences again and again, flow after flow rushing down the same path until the potential along the line of discharge is realized." The appearance of "ribbon-flashes" in some of the photographs is supposed to be due to unsteadiness or imperfections in the instruments.

The present greater proportion than formerly existed of men who are active and vigorous after passing seventy years of age, and all the way even up to ninety, denotes one of the brighter phases of our civilization. The fact that such vigor is associated with different physical types, both suggests that there may be a general origin for it, and feeds the hope that it may partly depend on personal conduct. Dr. B. W. Richardson advises that the preparation to secure long life may begin with the training of children, by protecting them against mental disturbance as well as physical hardship; and may be carried out in more mature life by combining, with hygienic living, healthful activity of mind with lively interest in all things that make for good, while restraining or avoiding passion, undue excitements, and unlovely qualities.

EDITOR'S TABLE.

TARIFF LEGISLATION.

THE tariff question is one that will not down. So long as the government of any country interposes arbitrary obstacles to the activity of the people, so long as it undertakes to make artificial channels for industry, to open markets here and close them there, to dictate the prices at which goods shall be sold —so long, in a word, as it assumes the prerogatives of an all-wise Providence in directing the affairs of individuals and showing them how to be happy—so long will there be "a doleful song steaming up" of the ignorance, incapacity, and injustice that mark its action. We endeavored to show, a couple of months ago, that a policy of protection, as it is called, naturally and inevitably allies itself with fraud and extravagance in the Government, and we do not think the demonstration can easily be refuted. The essence of the protective system is that the Government or the Legislature undertakes to make higher prices for goods by shutting out competition from abroad. Is it to be supposed for one moment that the people for whom a favorable price is thus to be made will not give pecuniary support to the party that so arranges things for their benefit? Is it not perfectly known that election funds are provided in this way, and that the taxing power is thus virtually put up to sale? The crowning disgrace of the worst days of the Roman Empire was that the supreme power in the state was made a matter of bargain and sale with a corrupt soldiery. We are far removed from the days of the Roman Empire; but how far are we removed from its methods? The question is a serious one.

We publish in this number of the Monthly the conclusion of a carefully prepared article by Mr. Edward Atkinson bearing on this subject, the first part of which will be found in the August number—an article which we trust will receive the attention it merits. Take one statement that Mr. Atkinson makes—and he is a writer who is known to be careful about his facts: "On the plea that this branch of industry" (production of iron) "should be sustained, the consumers of iron and steel in this country have paid a sum in excess of the price paid by the consumers who have been supplied by Great Britain and Germany, ranging from $50,000,000 to $80,000,000 a year. The excess of price has not been turned over to the workmen by the owners of the mines and works." Not at all; the workmen have been left to compete as savagely as they chose with one another, and with a constant stream of new-comers; and the manufacturers, profiting thus by cheap labor, have been enabled to carve huge fortunes for themselves out of the excess in price secured to them by the Legislature. It is no wonder if want of gratitude for such big mercies struck Chairman Foster as a most hideous crime; but such ingratitude is the exception rather than the rule, and would chiefly manifest itself when the monopoly seemed secure against attack; a little danger would develop "barrels" of gratitude.

The misery is that we have a manufactured and altogether falsified public opinion on this subject—a public opinion, we fully believe, which has not attained its present consistency without much not altogether disinterested advocacy. What is the use of having the "sinews of war" if you do not employ them? Money speaks in more senses than one; the chamber of Danaë is not the only sanctum that has been violated by a shower of gold. Be this as it may, however, certain it is that the public at

large have very erroneous ideas as to the actual results of a protective policy. Most think that, in some mysterious way, protection confers a benefit upon all. It is notorious that in many "protected" occupations wages are at a minimum; it is certain that multitudes suffer from their enforced exclusion from foreign markets; and it is a conspicuous fact that private fortunes are on the increase both in number and in average amount: yet still the delusion is cherished that protection is making the nation, as a whole, richer and more prosperous. Mr. Atkinson says distinctly that "there is a vastly greater proportion of farmers and farm laborers whose home market depends upon the export trade than there is of those who might possibly be harmed if, through imports of foreign articles, the demand for their own products were reduced." He ridicules, and with good reason, the idea that Congress is fit to choose occupations for the people. "What an absurdity!" he exclaims. "As if the people were not bigger than any Congress that ever existed, and could not manage their own affairs vastly better than the average member." With all respect to our valued contributor, we do not think he strikes quite the right note here. There is no need to flatter the people at the expense of Congress, which, after all, is elected by the votes of the people, and contains just as much wisdom and patriotism as the people care to put into it. The point is not that the people are wiser on the average than Congress, for that is not certain; but that no individual is wise enough to undertake to interfere with the natural laws of supply and demand, or to substitute artificial adjustments of his own devising for those naturally existing in the economic sphere. We would not trust all the wisdom in the country to undertake such a task. There is this, too, to be considered: that each private individual feels for himself the pressure and influence of surrounding conditions upon his business, and adapts himself thereto as best he can; whereas the Legislature deals with business generally — the business of the whole country—upon more or less abstract principles. In this sense the action of the average individual is apt to be wiser than the action of Congress —not because he is wiser than the average Congressman, but because he is dealing with a problem more or less level with his powers, whereas Congress undertakes to deal with one wholly beyond its powers.

A strong point made by Mr. Atkinson is his demonstration that even "infant industries" do not need to be nursed by a tariff when they are properly located and have large markets open to them. The instance he cites is that of our own iron and other manufacturing interests in the Southern States. On the principles we constantly hear maintained by protectionists, the manufacturing industries of Pennsylvania and Massachusetts should have crushed out any attempt at competition in the South, the latter being unable to "protect" itself by a tariff; but nothing of the kind has happened, and Southern industries are yearly increasing in volume and importance. This is an argument to which there is no answer. If the industries of the South could maintain and develop themselves in the face of the competition of heavily subsidized industries, commanding vast capital and fully organized, in the North, will any one pretend that our national industries, so far as they were in any way suited to the country, could not have maintained and developed themselves in the face of foreign competition?

We can not but believe that the common sense of the country will see before long that this, the youngest of nations, instead of leading the van in the application of sound and progressive principles of economic policy, has been hugging to its bosom the narrowest

and most unenlightened principles of an antiquated state-craft. While the spread of knowledge and the improvement in means of communication are drawing men together, and more or less effacing the lines of separation between nation and nation, this country, which, having received, in point of territory and material resources, the fairest and richest heritage of all, might have been expected to show the brightest example of good feeling and hospitality to other peoples and governments, has apparently considered it its mission to antagonize as far as possible the unifying influence of the modern spirit, to counteract the work of science in drawing the nations together, and to promote to the extent of its power a *régime* of international exclusiveness and jealousy. Shall we not some day wake up to a sudden shame of our conduct as a people in this matter? Shall we not some day be led to feel that we owe the world a better example? What is the use of endowing colleges and teaching the rising generation how to subdue the forces of nature, if, after the forces of nature have been subdued, and the life-giving and health-giving currents of international intercourse are prepared to flow in full tide of beneficent activity, we empower a lot of politicians at Washington to place artificial obstacles and resistances in the way of our commerce? The thing is really too absurd — philosophy and religion alike proclaiming the solidarity of human interests, science showing how natural obstacles to intercourse may be reduced to a minimum, while politics—flouting all the teachings of religion and philosophy, handicaps the achievements of science and insists on the perpetuation of a semi-barbarous *régime* of international hostility. Does any one say the word "hostility" is too strong? It is not too strong. What more hostile thing can we do to any one than to refuse intercourse with him? What deadlier or crueller form of hostility is there than the "boycott"? Of course, in boycotting others, we boycott ourselves; for, big as we are, we are not the whole world. What Mr. Atkinson is striving to show is the injurious effect of the boycott upon ourselves. We heartily wish him success in his patriotic labors; but we could wish also that a more generous sentiment might come and help to lift us out of our present false and retrograde position.

Our biographical sketch this month is devoted to Prof. T. C. Mendenhall, Superintendent of the Coast Survey and retiring President of the American Association for the Advancement of Science. As the author of the sketch rightly observes, we have in this gentleman a typical specimen of that class of Americans who, by the determined cultivation and development of their natural gifts, have arrived at the highest distinction. Many perhaps will consider the surroundings of Prof. Mendenhall's boyhood as unfavorable to his becoming eminent; but there is an element in his early school training, commonplace as that may appear, which to our mind was decidedly favorable, because it contributed directly to the formation of those habits of observation and independent thinking which are conspicuous in the characters of able men. Deriving from his father an inquiring turn of mind, the boy was fortunate enough to fall into the hands of a teacher who was an interested observer of physical phenomena, and who was in the habit of occasionally varying the school-work by such simple experiments as were within the means at her command. Insignificant as this episode may appear to many, it was well calculated to arouse the interest and fix the attention. The native curiosity of the childish mind was stimulated, and observation, experiment, and reasoning on his own account were the natural result.

Under the system of public-school administration that now prevails, especially in our large cities, this Quaker lady would not have been allowed to break the tedious routine of book-study with any such diversions. Any attempt on her part to observe the individual aptitudes of her pupils, to foster them, and qualify the boys to put their faculties to the best use of which they were capable would have been frowned down as inconsistent with the true purposes of the school. On the other hand, she would have been compelled, under penalty of dismissal, to put them all through an identical Procrustean drill, which tends to dull the faculties, suppress the aptitudes, and destroy that individuality of character in which alone resides the possibility for the highest usefulness of the man.

LITERARY NOTICES.

THE ART OF AUTHORSHIP. Compiled and edited by GEORGE BAINTON. New York: D. Appleton & Co. Pp. 355. Price, $1.25.

THIS book is described in its sub-title as Literary Reminiscences, Methods of Work, and Advice to Young Beginners, personally contributed by Leading Authors of the Day; and, rightly used, it may be of great assistance to all persons who desire to write well. The compiler, seeking material for illustrating a lecture on the Art of Composition and Effective Public Speech, bethought himself to secure, if possible, personal experiences and counsels from a few of the leading writers and speakers of the day. The volume is the outcome of that effort. Replies are published from one hundred and seventy-nine English and American authors—poets, novelists, essayists, historians, and scientific writers—each giving an account of his literary history, methods in composition, or his impressions of what constitutes good writing, and how the object is attained. Many of the contributors compress their views into a sentence or even a maxim; and there is a singular unanimity in the conclusion which they all reach. The whole lesson of this book of the experiences of more than a hundred and seventy-five successful authors may be expressed by saying that the art of good writing consists in having something to say and saying it in the clearest manner possible. A few of the expressions of representative authors in different fields may be quoted. The compiler has attempted to classify the observations under such headings as Good Writing: a Gift or an Art? Methods, Conscious and Unconscious; On Literary Style; The Strength of Simplicity; A Protest against Obscurity; and Truthfulness to One's Self; but the divisions so blend into one another, and all cluster so immediately around the single principle already stated, that we have found it impossible to keep the lines distinct. Prof. Huxley would advise the young writer, rather than ape the great writers, to make his style for himself, as they did. They were great "because, by dint of learning and thinking, they had acquired clear and vivid conceptions about one or other of the many aspects of men and things; . . . because they took infinite pains to embody those conceptions in language exactly adapted to convey them to other minds; . . . and because they possessed that purely artistic sense of rhythm and proportion which enabled them to add grace to force, and, while loyal to truth, make exactness subservient to beauty." To Prof. Tyndall, to think clearly is the first requisite; next, to express clearly in writing what he thinks. But this is not enough, and, with a good ear, sound judgment, and a thorough knowledge of English grammar, one must have a peculiar sensitiveness to the charm of a good style. The only tendencies that enable Mr. Francis Galton to write intelligibly "are a great desire to be clear in thought and distinct in expression, and an inclination to take much pains." He has, further, a clear appreciation of good and clear writing by others, and a love of getting at the exact meaning of words. Sir John Lubbock thinks that "there is no better way to improve one's style than by the study of the greatest masters of English." Grant Allen attaches much importance to the average classical education, and looks out deliberately for the most graphic and interesting way of putting things. John Burroughs believes that "earnestness is the great secret of forcible composition." Mr. Lowell has formulated the rule that every sentence must be clear in

itself and never too long to be carried, without risk of losing its balance, on a single breath of the speaker. Mr. Stedman would advise the literary aspirant that the first thing is to have "something he must say or express, and then he will say it in his natural and special way; and his way forms his style, and his style is thus the man." Mr. R. D. Blackmore, author of Lorna Doone, first makes sure what he means, then arranges the words in straight order without waste, and then looks at them, with a stranger's mind, to learn whether he would take them as himself had done. Mr. Edward Dowden regards as the most important thing, in writing narrative, "to discover and then conceal a rational order in the sequence of topics." In many cases the "logic" would be one of the emotions rather than of the intellect. Mr. F. Marion Crawford advises boys to cultivate style by taking pains about their letters. Mr. Thomas Hardy's impression is that if one "has anything to say which is of value, and words to say it with, the style will come of itself."

SEMITIC PHILOSOPHY: Showing the Ultimate Social and Scientific Outcome of Original Christianity in its Conflict with Surviving Ancient Heathenism. By PHILIP C. FRIESE. Chicago: S. C. Griggs & Co. Pp. 246.

THE speculative theories of the Semites are not discussed in this work, as might be supposed from its title. It is named Semitic to distinguish it from "the philosophies of Greece and Rome and the Orient," and because the author of its great revival was a Semite. We learn that it is "the Christian doctrine of the kingdom of God," and that this formula implies a philosophy "all of which may be grasped into the one first principle as the uniformity of the uniformities of God's action." Christ did not intrust this precious system to writing because language is defective, but he "referred its keeping" to a better vehicle of thought, "the sensuous ideas." These are explained as possessing magnitude, color, motion, and relative place; superior to the differentials of mathematics, in that they are qualitative as well as quantitative, and, to cap the climax, they are "constructed, like the rest of the body, by man's spirit"! In spite of the inefficiency of language, Mr. Friese gives us "An Ideal Written Social Constitution," and describes in another chapter a general social reformation. Whether we agree or not with his remedies and conclusions, he fully persuades us that words are poor instruments, and a snare for the unwary.

MONOGRAPHS OF THE UNITED STATES GEOLOGICAL SURVEY. Volume XV. THE POTOMAC OR YOUNGER MESOZOIC FLORA. By WILLIAM MORRIS FONTAINE. Part I, Text; Part II, Plates. Washington. Pp. 377, Plates 180.

IN his introduction the author states that the formation whose flora he describes was for a long time included in the so-called Trias of the Atlantic slope. Prof. W. B. Rogers, however, early recognized the difference between this group of strata and most of the Mesozoic of Virginia. Nearly all the plants described in this work were collected by the author in Virginia; the few others were obtained from Maryland. The extent of the ground that Prof. Fontaine has examined makes him confident that the fossils herein described give a fair notion of the flora of the "Potomac" period. He gives the locations of the places in which plants have been found, and describes the mode of occurrence of the specimens. He describes also the location and geology of the Potomac beds. The botanical descriptions of the species to the number of three hundred and sixty-five occupy the greater portion of the volume of text. A series of tables, comparing the Potomac plants with previously described fossil floras, are appended by permission of Prof. Lester F. Ward, by whom they were prepared, for his own use.

BULLETINS OF THE UNITED STATES GEOLOGICAL SURVEY. Nos. 54, 55, 56, and 57. Washington.

THE first of these four bulletins is a volume of over three hundred pages by *Carl Barus*, entitled *On the Thermo-electric Measurement of High Temperatures*. In the introduction a general account of methods of pyrometry is given. The first chapter deals with the degree of constant high temperature attained in metallic vapor baths of large dimensions. The calibration of electrical pyrometers, by the aid of fixed thermal data and by direct comparison with the air thermometer, is fully described. A chap-

ter is devoted to certain pyro-electric properties of the alloys of platinum, and the pyrometric use of the principle of viscosity is set forth at length. The monograph is copiously illustrated with cuts of apparatus, charts, and diagrams.

No. 55 is a *Report of Work done in the Division of Chemistry and Physics*, by *Frank W. Clarke*, Chief Chemist. It embraces papers recording examinations of a number of minerals, and miscellaneous analyses of various minerals and waters.

No. 56 is a paper on *Fossil Wood and Lignite of the Potomac Formation*, by *Frank H. Knowlton*, giving a history of the study of the internal structure of lignites, and systematic descriptions of silicified species.

No. 57 is a *A Geological Reconnaissance in Southwestern Kansas*, by *Robert Hay*. It gives an outline of the geological features of the region, incidentally touching upon points that have an economic bearing. The paper is accompanied by a geologic map of southwestern Kansas, and by diagrams of sections and buttes.

PESTALOZZI, HIS LIFE AND WORK. By ROGER DE GUIMPS. Authorized Translation by J. Russell, with an Introduction by the Rev. R. H. Quick. New York: D. Appleton & Co. Pp. 438. Price, $1.50.

IT is very proper that the Life of Pestalozzi should be the first biographical work to be incorporated in the International Education Series. No one, perhaps, of the devoted men who have labored for the advancement of education has singly contributed more to its improvement or left a broader mark upon its after-course than he. It is to him, says the author of this work, that we owe the reform of elementary education—a reform, however, which, notwithstanding the progress already made, is far from complete; and his history must, above all, be a history of the great idea which, in its successive stages, he sought to put into practice. This idea was the education of all the people, and that by drawing out their faculties. The conception of a learned education had already been worked out before his time, but this could only be for the few. Pestalozzi's life was an effort to realize his idea of the extension of the privileges of education. It was, Dr. Harris remarks, "a succession of experiments, each ending in a failure of some sort. These failures are followed by a period of depressive reflection, in the course of which Pestalozzi seems to become conscious of the personal weakness or unwisdom that had caused his plans to go wrong. He puts the fruits of his experience into a treatise, and is inspired to begin again a new experiment." These experiments and reflections are set forth in detail in Baron de Guimps's vivid memoir, which is prepared very largely from Pestalozzi's letters. His first experiments were made with his son, upon whom he intended to apply Rousseau's ideas. But he was compelled at every step to stop and fall back upon his own observations and the memory of the teachings of his mother, who had devoted herself with complete abnegation to the education of her children. "Struck by the child's natural need of continual activity, and by the abundance and versatility of its physical, moral, and intellectual faculties, it occurred to him that by guiding all these powers aright, and by varying work in such a way as to prevent fatigue, it would be possible to teach children not only to earn their bread, but to cultivate their intellectual and moral nature at the same time." So he projected his agricultural and manual labor institution at Neuhof, the close of which, after five years, was followed by the publication of a series of works in which his ideas were presented free from all foreign alloy. The results of his succeeding experiment at Stanz, as summed up by Morf, show forth the essential principles upon which the general reform of elementary education in the present century has been conducted. His career at Burgdorf is chiefly remarkable for the illustrations it afforded, in his method and in the books he made there, of the doctrine of sense-impressions as the foundation of instruction. The lamentable failure at Iverdun left Pestalozzi at eighty years of age with his hopes disappointed and his illusions dispelled. But it did not break his courage or stop his activity. He immediately set himself to work, and wrote the Song of the Swan, one of his most remarkable books; the Experiences of my Life, in which he blamed himself for all his misfortunes; a fifth part of his Leonard and Gertrude, and a supplement to his Book for Mothers. The story of his life, the telling of which is invested with a great deal of

interest, is followed by a chapter of Personal Recollections by the author, who was one of Pestalozzi's pupils at Iverdun; and by accounts of his Religion, his Philosophy, and his Elementary Method, and of Niederer's Collaboration.

REPORT OF THE ROYAL COMMISSION ON THE MINERAL RESOURCES OF ONTARIO AND MEASURES FOR THEIR DEVELOPMENT. Toronto: Warnick & Sons. Pp. 566.

THE plan of the commission in outlining its work included inquiry into the geology of the province, with special reference to its economic minerals; description and maps of the working mines and important undeveloped mineral resources; trade in mineral products; information and suggestions on the subject of mining laws and regulations; and inquiry into the best means of promoting metallurgical industry. Its methods included examination of witnesses and personal visitation of important districts and places. A section of the report on the geology of the province includes a systematic account of each of its rock formations, with such a sketch of the general geological features of North America beyond Ontario as was necessary to make the description more complete and intelligible. In it the entire results of the geological surveys, otherwise scattered through many volumes of reports, are summarized and made accessible. The evidence that Ontario possesses great mineral wealth is abundant and is constantly accumulating. There are iron ores, gold, galena, arsenic, mica, fibrous serpentine, apatite, granite, and plumbago in the central and eastern counties; copper and nickel mines in the Sudbury district; gold-bearing quartz, copper, and nickel in the township of Denison; gold and silver bearing veins, iron, copper, galena, and "immense quarries of marble" along the north shore of Lake Huron; gold, silver, copper, iron, galena, plumbago, zinc, granite, marble, serpentine, and sandstone north of Lake Superior; a rich silver district west of Port Arthur, and beyond this district gold-bearing quartz, magnetic iron ore, and what is believed to be a continuation of the Vermilion iron range of Minnesota; and gold-bearing veins in the islands of the Lake of the Woods. A practical business basis has been reached in the development of a number of the minerals, as, for example, in the production of salt, petroleum, phosphate, mica, cement, gypsum, and building stones, and in the manufacture of brick, terra-cotta, tile, and sewer-pipe. Silver, copper, and nickel mines are worked with much skill and energy; iron-mining has been intermittent, but has good prospects; and it is confidently hoped that gold-mining will become one of the established industries of the country.

GLIMPSES OF FIFTY YEARS: THE AUTOBIOGRAPHY OF AN AMERICAN WOMAN. By FRANCES E. WILLARD. Introduction by Hannah Whitall Smith. Chicago: Woman's Temperance Publication Association. Pp. 700.

THE journals in this voluminous record are psychologically a contrast to the diary of Marie Bashkirtseff. "I have the desire of living upon this earth by any means in my power," wrote the young Russian artist, consumed by feverish thirst for fame. Twenty years earlier, a girl upon the Wisconsin prairie, struggling with aspiration, cried out, "What is it—what is it that I am *to be*, O God?" In this effort *to be*—not merely to be celebrated at any cost—there are no morbid yearnings for sensation, but a healthful striving for extended usefulness.

Miss Willard views her life in six phases: The welcome child, the happy student, the roving teacher, the tireless traveler, the temperance organizer, and the woman in politics. Three chapters descriptive of her girlhood, passed on a farm in Rock County, Wisconsin, give attractive sketches of pioneer life happily conditioned. There were no schools in this district, nevertheless the family was well educated. The mother had been a school-teacher, and was well read; the father was a student of Nature, and trained the children to observe the ways of birds and butterflies, the habits of gophers, squirrels, and ants; to know the various herbs, and what their uses were; to notice different grasses, and learn their names; to tell the names of curious wild flowers.

Very naturally the daughter became in later years "Preceptress in Natural Sciences." Her girlish habits show an early distaste for ordinary feminine occupations. Her life, as a student at Milwaukee College and the Northwestern Female College, is de-

scribed with enthusiasm, and her subsequent experiences as teacher in eleven schools, ending as Dean of the Woman's College at Evanston, are vividly given with interesting details. Miss Willard was by nature, however, neither a student nor a teacher. Routine was distasteful to her, and patient interrogation of Nature or life was foreign to her restless disposition. The opportunity for extensive travel with a friend accorded with her desires, and two years were spent abroad journeying over Europe, Syria, and Egypt. Shortly after her return she was invited to lecture upon her foreign gleanings, and soon drifted into public speaking. The latter and larger half of the book is devoted to the organization of the W. C. T. U., temperance talks, political speeches, reports of conventions, eulogies of men and women, and dissertations on problems social, industrial, and sanitary. It is to be regretted that these questions are too exacting and tumultuous to be satisfactorily laid to rest. It may be that the failure to give approximate solutions is connected with the mathematical inability which troubled Miss Willard as a teacher, and which is very conspicuous in the arrangement of her book. Her logical horizon is indicated by the following estimate of "one of the kings of the nineteenth century": "Meeting the skepticism of science with its own 'scientific method,' he *proves* that, if a man die, he shall live again!" But it must be remembered that we are told, in the introduction to this encyclopedic volume, that it is "a home book, written for her great family circle, to be read around the evening lamp by critics who love the writer, and who want to learn from her experience how to live better and stronger lives." This indulgent jury of half a million readers will doubtless render a verdict of unanimous praise, but an even larger audience may be unexpectedly entertained by this life-story, and find it worthily called "an object-lesson in American living."

THE STUDENT'S ATLAS. By RICHARD A. PROCTOR. London and New York: Longmans, Green & Co. Price, $1.50.

IN this little work, which was issued just before Prof. Proctor's death last year, the originality of its author is strongly evident. In most atlases, the different divisions of the earth are represented on different scales and often on different projections, so that the ideas they convey as to the shape and relative positions of the various land areas are far from correct. The oceans generally are not mapped at all, so no idea is given of the tracks of vessels across them, nor of the directions from each other of different parts of their shores. Prof. Proctor has avoided these defects in his atlas by depicting the whole surface of the globe on twelve maps, each representing the part of the surface of a sphere corresponding to one side of an inclosed dodecahedron. The maps are all on one scale and a uniform projection, and each occupies a double octavo page. There are also two index maps, which show the connection between the maps of the series. A brief description of each map is given in the introduction, and on the pages between the maps, usually left blank, Prof. Proctor gives the number and chief contents of the map on the other side of the leaf.

THE ECONOMIC BASIS OF PROTECTION. By SIMON N. PATTEN, Ph. D. Philadelphia: J. B. Lippincott Company. Pp. 144. Price, $1.

WE have wondered why some adherent of protection did not get out a book of this sort; for, in view of the pronounced tendency of free-traders to base their creed on fundamental principles, the neglect of protectionists to do the same looks like a confession that protection has no principles on which to stand. But now Prof. Patten has undertaken to give briefly the reasons for the faith that is in him. He asserts that free-traders take as their ideal a society in a "static" condition, while for a society in a "dynamic" or progressive state, which is the actual condition of America, protection is the only admissible policy. He maintains that a locality should not be encouraged to devote itself to the exclusive production of the commodity which it can yield best, because the surplus must pay the cost of long transportation to a market. A variety of things should be produced, and only such quantities of each as can be consumed in the vicinity. Although not so large a gross result could be obtained in this way as by devoting the productive power of the community to a specialty, the author evidently

believes that the net return would be greater. Many of our raw materials come from countries where industry is irregular and ineffective, and Prof. Patten argues that we should make ourselves independent of such sources of supply. He says that skill and capital employed in an orderly community will generally outweigh climatic and other natural advantages in an uncivilized country. As an instance he mentions the production of sugar in Germany from beets in competition with the cane-sugar of Cuba. Wool, he says, will be high in price while it remains the exclusive product of regions distant from the markets, and can only become cheaper when farmers in highly civilized communities take to raising sheep in connection with their agriculture. Prof. Patten maintains that trade between merchants of different countries which is profitable to the individuals is not necessarily profitable to the countries. Supposing a pound of coffee in Brazil would buy three pounds of sugar, while if taken to Cuba it would buy four pounds. In this case a trade profitable to dealers would spring up, and Prof. Patten asks whether such a commerce is so beneficial that the loss of it would work permanent injury to both nations. This, he says, is a matter of dispute. There are many other things in the book that friends of free trade will regard as matters of dispute, which are not so designated by the author. The volume is adapted to provoke discussion, and perhaps the more so because its small size prevents the insertion of facts and figures in support of the author's positions.

EIGHTH ANNUAL REPORT OF THE UNITED STATES GEOLOGICAL SURVEY, 1886–'87. By J. W. POWELL, Director. Washington. Parts I and II. Pp. 1095.

IN this report the director gives a full description of the business organization of the Survey, comprising the division of disbursements and accounts, the division of illustrations, the division of library and documents, and the editorial and miscellaneous division. During the year covered by the report, an aggregate area of 55,684 square miles had been surveyed during the field season and mapped during the office season. Topographic work was pushed forward vigorously in Massachusetts, at the joint expense of the State and Federal Governments, and the surveys of that State and of New Jersey are now practically completed. The survey of the District of Columbia and contiguous parts of Virginia and Maryland was finished, work was prosecuted in the southern Appalachian region with a large force, and extensive tracts were surveyed in the Western States and Territories. During the year geologic investigations were carried on by Prof. Pumpelly on the Archæan rocks of New England, by Prof. Irving among the iron-bearing and copper-bearing rocks of Lake Superior, by Prof. Shaler on the tide-marshes of the Atlantic coast, and by Mr. Gilbert on the structure of the Appalachian Mountains. Mr. Woodward made a careful resurvey of Niagara Falls, and investigations in glacial geology were carried on under Prof. Chamberlin. The combined investigations of the general geologic structure, and of the coal, oil, gas, etc., of Montana were somewhat crippled by the long illness and finally by the consequent resignation of the veteran geologist, Dr. Ferdinand V. Hayden, but during the latter part of the year the work was carried on by Dr. Peale. Other fields in which work was prosecuted are the Yellowstone National Park by Mr. Hague, the structural and mining geology of Colorado by Mr. Emmons, the volcanic deposits of California and Oregon by Captain Dutton, the iron-ore and marl beds of northern Mississippi and Louisiana by Mr. Johnson, and the Quaternary deposits of the coastal plain between North Carolina and New York under Mr. McGee. The area affected by the Charleston earthquake was also examined, and Mr. Becker completed his report on the quicksilver mines of the United States. Work in paleontology was carried on by Prof. Marsh, Mr. Walcott, Dr. Dall, Prof. Ward, and Mr. Scudder. One of the most important events of the year in systematic geology was the discovery by Dr. White and Mr. Hill of a great series of Cretaceous strata in Texas underlying the rocks hitherto regarded as the base of the American Cretaceous, and corresponding in many respects with the Lower Cretaceous deposits of Europe. Chemical work was carried on by Prof. Clarke, Mr. Chatard, and Messrs. Gooch and Whitfield. Mr. Day continued the collection of mining statistics. Several miscellaneous researches were also in progress. The report of the director is supple-

mented by administrative reports from the heads of divisions, which give further details concerning the work of the year. The following papers also accompany the director's report: Quaternary History of Mono Valley, California, by Israel C. Russell; Geology of the Lassen Peak District, by J. S. Diller; The Fossil Butterflies of Florissant, by Samuel H. Scudder; The Trenton Limestone as a Source of Petroleum and Inflammable Gas in Ohio and Indiana, by Edward Orton; The Geographical Distribution of Fossil Plants, by Lester F. Ward; Summary of the Geology of the Quicksilver Deposits of the Pacific Slope, by George F. Becker; and The Geology of the Island of Mount Desert, Maine, by Nathaniel S. Shaler.

JOHNS HOPKINS UNIVERSITY STUDIES IN HISTORICAL AND POLITICAL SCIENCE. Eighth Series. Edited by HERBERT B. ADAMS. Baltimore. Published monthly.

THE first subject treated this year in these studies was *The Beginnings of American Nationality*, by *Albion W. Small*, of which Chapters I, II, and most of III are given, forming a double number. (Price, one dollar.) The scope of this inquiry comprises the constitutional relations between the Continental Congress and the colonies and States from 1774 to 1789. Chapter II tells the composition and organization, and the acts of the Congress of 1774, and the corresponding acts of the colonies; while Chapter III gives a similar history of the Congress of 1775. A ten-page paper on *The Needs of Self-supporting Women*, by Miss *Clare de Graffenreid*, is included in the same pamphlet.

Part III of the current series contains an essay on *Local Government in Wisconsin*, by *David E. Spencer*, together with a sketch of *The Enoch Pratt Free Library* in Baltimore, by *Lewis H. Steiner*. (Price, twenty-five cents.)

Spanish Colonization in the Southwest is treated in Part IV, by *Frank W. Blackmar*. (Price, fifty cents.) This is an account of the efforts of Spain, by military, religious, and civil means, to colonize and secure control of California and the territory north of Mexico. It embraces a sketch of the celebrated mission system employed to Christianize the Indians of Upper California.

A double number is devoted to *The Study of History in Germany and France*, by *Paul Frédéricq*, being translations by Miss *Henrietta Leonard* of two papers by Prof. Frédéricq, of Ghent. (Price, one dollar.) In these papers the methods of the professors, the courses that they prescribe, and even their personal appearance and the habits of the students, are given in detail, and in a familiar and often amusing style. At one of the lectures in the University of Berlin, Prof. Frédéricq saw a listener using an ear-trumpet, and he tells us all about the queer contrivance in a foot-note. Among the masters of historical teaching whom he heard lecture in Germany were Treitschke, Droysen, Curtius, Pauli, Waitz, and Von Sybel. He also called upon Von Ranke, who no longer lectured. In Paris he heard MM. Alfred Maury, Paul Meyer, Victor Duruy, Monod, and Lavisse. In the same pamphlet with these papers is included a sketch of *Early Presbyterianism in Maryland*, by Rev. *J. William McIlvain*.

NATIONAL HEALTH. Abridged from The Health of Nations. A Review of the Works of Sir Edwin Chadwick, K. C. B. By BENJAMIN WARD RICHARDSON, M. D., F. R. S. London and New York: Longmans, Green & Co. 1890. Pp. 320. Price, $1.50.

THE demand for an inexpensive form of Sir Edwin Chadwick's writings led to the preparation of this volume. Selections have been made from the subject-matter of Health of Nations, omitting explanatory paragraphs, chapters relating to police regulation, poor-law administration, and historical accounts of sanitary effort. The essays have been rearranged and well classified in four parts: health in the dwelling-house; health in the school; health in the community; and health in the future. Under the first head the construction and economy of sanitary dwellings is considered, and the best mode of drainage, ventilation, warming, and securing freedom from dampness. The value of soft water is urged, and roof-gardens are recommended for crowded districts. The benefit of healthful homes is shown in the establishment of improved dwellings for working people in London, where the death-rate has been reduced in some localities from forty-two to eighteen per thousand.

The *half-time system* in education, which

Mr. Chadwick originated, is explained in Part II. This combination of mental and manual training we are beginning to recognize as a better educational method than mere cultivation of intellectual faculty. Mr. Chadwick states as a result of trial, "where there have been good approximations to the proper physiological as well as psychological conditions, as in the half-time industrial district schools, epidemic diseases have been banished and the rate of mortality reduced to one third of that which prevails among the general community." Among the more important subjects discussed in Part III are: practical remedies for intemperance, health *versus* war, and the connection of bankruptcy with ill health. In the closing chapters the financial outcome of better sanitation is figured; the lowering of the death-rate results in curtailment of funeral expenses, saving of labor and reduction of outlay in police and penal administration.

The dominant idea of the book is that prevention of disease, poverty, and crime is more economical than cure. It is singularly free from dogmatic assertion, and every practical suggestion is founded upon close observation or supported by careful study of statistics. Dr. Richardson has performed no slight labor in rendering this work accessible; it occupies less than half the space of Health of Nations, presents the biographical sketch in a shorter form, and contains an autotype portrait of the eminent sanitarian.

ADVANCED PHYSIOGRAPHY. By JOHN THORNTON, M. A. London and New York: Longmans, Green & Co. Pp. 342. Price, $1.40.

THE scope of this volume has been made to conform to the syllabus for the advanced stage of physiography of the Science and Art Department of the Museum at South Kensington, London. The matter that it includes falls largely in the field to which the name New Astronomy has been given. In the words of the preface: "It is concerned more with the physical and chemical constitution of the heavenly bodies than with their exact positions and movements, as discussed in the older department of astronomy. This older branch, however, has not been entirely neglected." Nearly all the contents of the book could be included under the heading astronomy, though there are chapters dealing with atmospheric and oceanic movements, terrestrial magnetism, measurement of the surface, size, and shape of the earth, secular cooling of the earth, and secular changes of climate. An appendix contains several tables, a number of paragraphs relating to the formation and the analysis of rocks, and a list of examination questions. Physiography in the title of this book is not equivalent to physical geography as it is often intended to be elsewhere. All the chapters are fully illustrated, especially those relating to spectrum analysis and to the constitution of the sun. A colored plate of spectra is also inserted.

MONOGRAPHS OF THE UNITED STATES GEOLOGICAL SURVEY. Volume XVI. THE PALÆOZOIC FISHES OF NORTH AMERICA. By JOHN STRONG NEWBERRY. Washington. Pp. 340. Plates, 53.

THE matter of this monograph is arranged with the design of representing the progress of fish-life in North America during the golden age of the fish tribe, as illustrated by the large amount of material that has come into the author's hands. He has undertaken to give references to all notices of our older fossil fishes hitherto published, and has added to them descriptions and figures of all the new forms that he has met with. The new material described has an important bearing upon some general questions as to the origin and development of fish-life on the earth which are referred to as they come up in the chronological arrangement of the descriptions. The fishes are described in the order of their geological systems, beginning with the oldest. The review stops at the top of the Coal Measures, as no Permian fishes from this country have ever come under the author's observation.

The subject taken by the president, *Lester F. Ward*, for his address at the tenth anniversary meeting of the Biological Society, of Washington, was *The Course of Biologic Evolution*. In opening, Mr. Ward spoke of the common error in regard to evolution, which puts every form of creature that lives or ever has lived among the direct ancestors of the human species. The course of biologic evolution has been rather like the branching growth of a tree, and Mr. Ward sets forth some of the laws in accordance with which

this development takes place. The first is the extinction of trunk lines of descent, by virtue of which a trunk sends up a branch which is capable of higher progress than the trunk itself, and in time comes to be regarded as the trunk. This in turn sends up a branch by which it is overtopped and superseded as the trunk of the ever-branching system. Another law is that of persistence of unspecialized types, instances of which are the persistence of low forms of articulates, mollusks, and reptiles with the dominant types of animals, while the higher forms of these orders have been extinguished by competition with these dominant types. Turning to the vegetable kingdom, Mr. Ward points out by what steps development has proceeded in this field from its earliest beginnings in cryptogamic life to its highest and latest expression in the gamopetalous dicotyledon. He then considers the influence in the modification of structure exerted by extra-normal causes—i. e., such as produce characters that are of only indirect use to the organism. The doctrine of natural selection has been severely criticised of late years, and the best way of defending it, Mr. Ward believes, is to take the ground that fortuitous variation goes on at all times, in many directions, and to great lengths, without any perceptible change in the degree of adaptation which the varying forms have to their environment. No beneficial effect need be felt until well-formed varieties have been developed. Among extra-normal influences in the vegetable kingdom are showy and fragrant flowers, and bright-colored and pleasant-flavored fruits. Another important influence of this class comprises the causes which in many cases make one sex differ so widely from the other.

An address was given by Dr. *Byron D. Halsted*, State Botanist of New Jersey, before the New Jersey Board of Agriculture last winter on the subject of *Rusts*, *Smuts*, *Ergots*, and *Rots*, in which he described some of the diseases that seriously affect field-crops, vegetables, and fruit, and named remedies that have proved successful in combating them. The paper comes to us in pamphlet form. It is free from botanical technicalities, and hence can be understood and used by any intelligent farmer. A list of the fungi most injurious to New Jersey farm-crops is appended, together with four plates in which many of them are figured.

Part VII of Volume I of the *Records of the American Society of Naturalists* contains a list of members, with their professional positions and addresses, and a record of the eighth meeting of the society, held in New York, December 27 and 28, 1889. The president, Prof. Goodale, of Harvard, took Science in the Schools as the subject of his address, and suggested as a means of securing genuine science study in the lower schools the preparation of a book on physical geography, the part relating to each tributary science to be made by a master of the science, and the whole to be co-ordinated by a master in pedagogics. An outline of laboratory work in each of the sciences should be included, some one of which should be selected by the teacher for his pupils to become practically acquainted with. Since the last meeting of the society, the addition of science to the requirements for admission to college, and to the general course of study in common schools, has been urged in the name of the society by Prof. William N. Rice and other members before various educational associations. The officers elected for the present year include Prof. H. Newell Martin, president, and Prof. Henry H. Donaldson, of Clark University, secretary.

A detailed examination of *The Marine Climate of the Southern California Coast and its Relations to Phthisis* has been published in a pamphlet by *P. C. Remondino*, M. D., of San Diego. In passing from the islands off the coast to the mountains and down into the desert beyond, the author distinguishes six varieties of climate that are met with. Three of these have more or less of a marine character, while the others are land climates, but none of them can be called moist. Dr. Remondino tells what are the prevailing temperatures, quantities of air-moisture, character of the seasons, weather, etc., in different parts of the region he describes, and bears confident testimony as to the benefits that consumptive patients may expect from the dry and equable air of the coast, or the foot-hills, or the mountains of southern California.

Bulletin No. 22 of the Department of Agriculture consists of *Reports of Observations and Experiments in the Practical Work*

of the Division, by a number of agents. It comprises reports on methods for destroying the red scale of California, by D. W. Coquillett; on insects of the season in Iowa, by Herbert Osborn; on insects affecting grains, by F. M. Webster; on California insects in general, by Albert Koebele; on Nebraska insects, by Lawrence Bruner; and entomological notes from Missouri for the season of 1889, by Mary E. Murtfeldt.

The address of *William L. Dudley*, before the American Association at Toronto last year was on *The Nature of Amalgams*. It is now published as a pamphlet, and is mainly occupied with a history of discoveries relating to the chemistry of amalgams. It contains a bibliography of the subject, occupying eleven pages.

In a paper on *The Cradle of the Semites*, read before the Philadelphia Oriental Club, Dr. *D. G. Brinton* brings together the evidence tending to show that the progenitors of the Israelites were of a blonde type, and came to Asia from northwestern Africa. Prof. Morris Jastrow, Jr., replied to this in a paper directed to showing the insecurity of some of the grounds that Dr. Brinton had taken. The two essays are published in a pamphlet together.

A table of *Poisons and their Antidotes* has been issued by The National Druggist (Druggist Publishing Company, St. Louis). It is printed on one side of a sheet of strong manila paper, and its directions are brief and clear. It would be somewhat more useful to unscientific persons if it stated that sodium and magnesium sulphates are also known respectively as Glauber's and Epsom salts, and if it avoided such words as emetocathartic.

The Report of the Commissioners of the State Reservation at Niagara, for October, 1888, to September, 1889, records the doings of the commission during the year designated, and their recommendations for future work. G. K. Gilbert's History of the Niagara River, noticed in the July number of this magazine, is published in the same pamphlet. The commissioners have issued also a folded sheet containing suggestions to visitors, and a map of the vicinity of the falls.

Students of political science now have an opportunity to compare a translation of *The Federal Constitution of Germany* (University of Pennsylvania, 50 cents) with the Constitution of the United States. The translator is Prof. *Edmund J. James*, who has based his version on the one printed in the Government report on Foreign Relations for 1877. A detailed table of contents is prefixed to the document, and a historical introduction, which is essentially a translation of the corresponding section in Von Rönne's Verfassung des deutschen Reichs.

Among its Circulars of Information for 1890, the Bureau of Education has issued *English-Eskimo and Eskimo-English Vocabularies*, compiled by Ensign *Roger Wells, Jr.*, U. S. N., and Interpreter *John W. Kelly*. These vocabularies contain 11,318 words, and are preceded by twenty pages of Memoranda concerning the Arctic Eskimos in Alaska and Siberia, by John W. Kelly. These memoranda embrace traditions, bits of history and description, customs and superstitions of the Eskimos. Two maps are contained in the pamphlet.

The *School Algebra* of Prof. *G. A. Wentworth*, of Phillips Exeter Academy, is intended to present a thorough and practical treatment of the principles of elementary algebra. It covers sufficient ground for admission to any American college; and it and the author's college algebra are enough to occupy the time given to the subject in our best schools and colleges. The problems are carefully graded, mostly new, and either original or selected from recent examination papers. The early chapters are quite full; and the introductory chapter presents a free discussion of the principles with which the student beginning algebra ought to be acquainted.

Dreamthorpe, a Book of Essays written in the Country (George P. Humphrey, Rochester), is a reprint of some of the prose writings of *Alexander Smith*, who wrote but little, but that little, whether the prose or poetry of it, of such a character as to cause regret that he did not write more, and to give him a place among English classic authors. The title of the work suggests that the essays were written from the domain of fancy; they certainly embody the author's own thoughts, and not what he borrowed from another. In style they are of the very best English. Some of them are purely literary; others

are on such subjects as The Fear of Death and Dying, A Lark's Flight, The Importance of a Man to Himself, Books and Gardens, and Vagabonds.

A series of philosophical papers has been added to the publications of the University of Pennsylvania, under the editorship of Profs. Fullerton and Cattell. The first number of the series is a thick pamphlet by Prof. *George Stuart Fullerton*, entitled *On Sameness and Identity*. In the first part of the essay the author enumerates and defines at length seven kinds of sameness, and then proceeds to discuss the samenesses of the real self. He states that "men use the word identity to mark certain kinds of sameness in which there is little or no consciousness of duality." A second division of the paper is a critical presentation of the ways in which various philosophers have dealt with sameness.

An essay on *Maimonides*, giving an account of his philosophy, has been published by Rabbi *Louis Grossmann*, D. D. (Putnam, 25 cents). In a rough classification Dr. Grossmann would put Maimonides with philosophers of religion, since he devoted special attention to the relation between metaphysics and Jewish theology. While crediting Maimonides with great philosophical insight, Dr. Grossmann is not blind to his limitations, and points out several errors which hampered him in common with his contemporaries.

An autobiography of rare interest is presented in *The Life of George H. Stuart*, written by himself, and edited, at his request, by Prof. *Robert Ellis Thompson*, of the University of Pennsylvania. Mr. Stuart's life was associated with some of the most exciting events of our recent history. As the editor characterizes his career, it "extends through a memorable half-century of our country's history, and touches more or less closely upon all the great religious and philanthropic movements of that time. While he has not taken any part in political life or sought any eminence in that field, he has been brought into contact with many of our public men, from the anti-slavery group of half a century ago, to Lincoln, Grant, and the national leaders of our own time. . . . On the other hand, he has occupied almost a unique position in our ecclesiastical life, as representing that spirit of unity which has been awakened in the American churches during and since the war." Mr. Stuart was born in County Down, Ireland, and came to the United States in 1831, when about fifteen or sixteen years old. In 1836 he heard one of Mr. Gough's temperance addresses, and from that moment became an upholder of every measure for temperance. He was among the first to join the anti-slavery movement. When the question of the union of Presbyterian churches came up, he did his best to advance it. He was instrumental in introducing the Young Men's Christian Association into the United States and in extending its organization. Early in the civil war he saw a place in the matter of care for the condition of the soldiers which the Sanitary Commission, admirable as its organization was, could not wholly fill, and called the Young Men's Christian Association to the institution of the Christian Commission, and became its president. In this position he was brought into relations with the officers of the Government and the army and with the soldiers. When General Grant was chosen President, Mr. Stuart was given the first invitation to be Secretary of the Treasury. The condition of his health prevented his accepting the office, but he was one of President Grant's most trusted counselors, and assisted him in his efforts to have the Indians dealt honestly with. He died in March, 1890. His autobiography, besides delineating himself, is a picture of the times in which he lived, and derives further interest from incidental notices of men eminent in the State, the Church, and philanthropy with whom he had relations.

A number of articles and addresses have been published by Prof. *Charles S. Mack*, M. D., in a small volume under the title *Philosophy in Homœopathy* (Chicago: Gross & Delbridge). The purpose of the book is to furnish students of homœopathy and the general public with arguments on which to rest a belief in homœopathic treatment. One of the chapters is an address to some students in an allopathic medical college, in which a list of questions submitted by the students are answered. An appendix contains an essay on the treatment of criminals, and a discussion of an article by one De

Charms, suggesting an affinity between homœopathy and Swedenborgianism.

A paper by *G. W. Hambleton*, M. D., on *The Suppression of Consumption*, to which we called attention some months ago, when it was published in Science, has been reprinted in a neat pamphlet, with flexible cloth covers (N. D. C. Hodges, 40 cents). It forms the first number of a series to be called Fact and Theory Papers. Dr. Hambleton maintains that consumption is produced by causes that check free respiration and by dusty air, and the first aim of his treatment is to secure the breathing of a full supply of pure air.

Count Tolstoi's Kreutzer Sonata, translated by Benjamin R. Tucker and published by him in Boston, is a story of a man's vehement passion for his own wife, and his consequent jealousy. These feelings become ungovernable upon hearing the performance of the music which gives the story its title, and events following this incident prompt the sufferer to murder. The author's intention, though his method may be mistaken, is to teach a salutary moral lesson.

The *First Annual Report of the Agricultural Experiment Station at Cornell University* covers the eight months from April 30, 1888, to the end of the year. The reports of the director and other officers relate mostly to the business of organization. In transmitting the report to the Governor of New York, Prof. C. K. Adams, President of Cornell University, states that, in organizing the station, the trustees of the university availed themselves in every practicable way of the large resources already forming a part of the College of Agriculture. The completeness of this outfit decided the trustees to use the expenditure for buildings provided for by the Hatch Act in erecting a building for the careful study of noxious insects. Appended to the report are the four Bulletins, which were also issued separately during the year. The chief topics treated in these Bulletins are an Experimental Dairy House, Experiments in feeding Lambs, The Insectary of Cornell University, and Growing Corn for Fodder and Ensilage. All of these papers are illustrated.

Under the title of *How to remember History*, the J. B. Lippincott Company publish a Method of memorizing Dates, with a summary of the most important events of the last four centuries, by *Virginia Conser Shaffer*. Each century is represented by a chart, and the chart is divided into a hundred squares, one for each year. Each square is divided into five subdivisions, answering respectively to events in war and peace; in politics, social and religious life; in literature, science, and art; miscellaneous events; and deaths. Different countries are represented by devices of color. When the date of any event is to be fixed, it is noted by filling, in the square standing for the year, the subdivision corresponding with the character of the event, with the color or colors corresponding with the country or countries to which the event relates. To the charts, which are given as specimens of what may be done, texts are appended, embodying a chronological table of the events represented, and reading accounts of the same events of considerable fullness. The plan is capable of indefinite modification and enlargement.

PUBLICATIONS RECEIVED.

Abel, Mrs. Mary Hinman. Practical Sanitary and Economic Cooking. Rochester, N. Y.: American Public Health Association. Pp. 190.

Armas y Cárdenas, José de. Medico-legal Observations on the Case of Don Estéban Verdú (in Spanish). Habana. Pp. 32.

Bean, Tarleton H. New Fishes collected off the Coast of Alaska, etc. Washington: Smithsonian Institution. Pp. 8.

Browning, Oscar. Aspects of Education. New York: Industrial Education Association. Pp. 48. 20 cents.

Childs, George W. Recollections of General Grant. Philadelphia: Collins Printing House. Pp. 104.

Chisholm, George G., and Leete, C. H. Longman's School Geography for North America. New York: Longmans, Green & Co. Pp. 384. $1.25.

Coast, U. S., and Geodetic Survey. Chart Corrections of the Coast.

Cox, Charles H. Protoplasm and Life. New York: N. D. C. Hodges. Pp. 67. 75 cents.

Crooker, Joseph Henry, Madison, Wis. Different New Testament Views of Jesus. Pp. 70.—The Bible and the Public Schools, or Dr. Bascom and the Supreme Court. Pp. 18.

Dall, William H., U. S. National Museum. New Species of Land Shell from Cuba (Vertigo Cubana). Pp. 2.

English, George L. & Co., Philadelphia. Catalogue of Minerals for sale. Pp. 100.

Fall, Prof. Delos, Albion, Mich. Sanitary Science. Pp. 10.

Gilbert, Charles H. Preliminary Report on Fishes collected by the Steamer Albatross on the Pacific Coast of North America. Washington: Smithsonian Institution. Pp. 78.

Goode, G. Brown. Museum-History and Museums of History. Pp. 22.—Origin of the National Scientific and Educational Institutions of the United States. Pp. 112. New York: G. P. Putnam's Sons.—The Literary Labors of Benjamin Franklin. Philadelphia. Pp. 21.

Gurney, E. H. Reference Handbook of English History. Boston: Ginn & Co. Pp. 114. 85 cents.

Hale, Horatio. British Association Report on North American Ethnology. London. Pp. 97, with Plates.

Howard, George E., University of Nebraska. Development of the King's Peace and the English Local Peace-Magistracy. Pp. 65.

Howe, H. M. The Metallurgy of Steel. New York: Scientific Publishing Company. Pp. 880. $10.

Hyde, E. W. The Directional Calculus. Boston: Ginn & Co. Pp. 247. $2.15.

Iowa, State University of. Bulletin from the Laboratories of Natural History. Vols. III and IV. Iowa City. Pp. 180, with Plates.

Jones, Hon. John P., United States Senate. Speech on the Free Coinage of Silver. Pp. 116.

Jordan, David Starr. Catalogue of Fishes collected by the United States Fish Commission Steamer Albatross. Washington: Smithsonian Institution.

Jordan, David Starr, and Evermann, B. W. New Species of Fish from Tippecanoe River, Ind. Pp. 4.

Kiddle, Henry. A Text-Book of Physics. New York: William Wood & Co. Pp. 288. $1.

Lesquereux, Leo. Remarks on some Fossil Remains considered as Peculiar Kinds of Marine Plants. Washington: Smithsonian Institution. Pp. 12, with Plate.

Lewis, T. H. Ancient Fireplaces on the Ohio. Pp. 5.

Loti, Pierre. Rarahu. New York: W. S. Gottsberger & Co. Pp. 296.

Lucas, Frederic A. Catalogue of Skeletons of Birds collected by the Steamer Albatross. Washington: Smithsonian Institution. Pp. 4.

McGill University, Montreal. Annual Calendar of the Faculty of Medicine. Pp. 108.

Mackay, A. H., Halifax, N. S. Fresh-water Sponges of Canada and Newfoundland. Pp. 12, with Plates.

Mohr, Charles, Mobile, Ala. The Medicinal Plants of Alabama. Pp. 17.

Moll, Albert. Hypnotism. New York: Scribner & Welford. Pp. 410. $1.25.

Montgomery, D. H. The Leading Facts of American History. Boston: Ginn & Co. Pp. 359 + lili. $1.10.

Myerovitch. The Origin of Polar Motion. Chicago: Rosenberg Brothers, Printers. Pp. 32.

Nebraska, University of. University Studies. Vol. I, No. 3, July, 1890. Lincoln. Pp. 104.

New Jersey. Annual Report of the State Geologist for 1889. Pp. 112.—Final Report, Vol. II. Mineralogy, Botany, Zoölogy. Pp. 642.

New York Agricultural Experiment Station's Bulletins, Nos. 19 and 20 (New Series). Pp. 40.

North, S. N. Dexter. Bulletin of the National Association of Wool Manufacturers. Quarterly. Pp. 20. 50 cents.

Payne, F. F., Toronto, Ontario. The Eskimo of Cape Prince of Wales, Hudson's Strait. Pp. 3.

Pickard, J. L. School Supervision. New York: D. Appleton & Co. Pp. 175. $1.

Pyat, Felix. The Rag-Picker of Paris. Boston: Benjamin R. Tucker. Pp. 317.

Ridgway, Robert. The Genus Xiphocolaptes of Lesson. P. 1.

Sociedad de Fomento Fabril, Santiago, Chili. Monthly publication. Pp. 48. 40 cents.

Sutton, J. Bland. Evolution and Disease. New York: Scribner & Welford. Pp. 295. $1.25.

Tittmann, O. H. Table for the Reduction of Hydrometer Observations of Salt-Water Densities. Washington: Coast Survey. Pp. 3.

Townsend, George Alfred. Mrs Reynolds and Hamilton. New York: F. Bonaventure. Pp. 276. 50 cents.

Wheeler, Captain George M. Report upon United States Geographical Surveys west of the One Hundredth Meridian. Washington: Government Printing-Office. Pp. 771, with Maps.

White, Charles A. Mesozoic Fossils from Islands of the Strait of Magellan.

POPULAR MISCELLANY.

The Water-Supply of Memphis.—The city of Memphis, Tenn., now possesses a complete supply of pure water, which forces itself through artesian wells from a depth of about four hundred feet below the surface. The artesian source was discovered in 1887 by Mr. R. C. Graves, of the Ice Company, who, seeking water suitable for the manufacture of ice, made borings to the depth of three hundred and fifty-four feet. There he struck water, which at once rose to the surface and spouted up in a gushing fountain. This source has since been utilized in numerous private wells of hotels and manufacturing establishments and in the public supply of the city. It lies in a stratum of "water-bearing sand," nearly eight hundred feet thick, which is reached after boring through the one hundred and forty-five feet of hard, impervious clay that forms the "bed-rock" of the region, and furnishes a permanent bottom to the Mississippi River. Above this is a stratum of gravel twenty feet thick, topped by the bluff formation of loess that constitutes the surface of the region and gives character to it. These formations extend a considerable distance to the eastward, and there outcrop one after the other—the water-bearing sand, which is sandwiched between the clay already mentioned and another clay below it, being represented by a tract twenty miles across and of indefinite length, which may be seen in Fayette and other counties along its line down into Mississippi. This region, on which is gathered the water that percolates to the wells of Memphis, is, in its general surface, about three hundred feet above high water of the Mississippi. In May, 1889, there were fifty-seven bored wells in Memphis, five of which only reached the water-bearing sand, while the others went down to depths of from three hundred and fifty to four hundred feet and more. They are included within an area three miles long and one mile wide. The average depth of the thirty-two wells through which the water-supply is

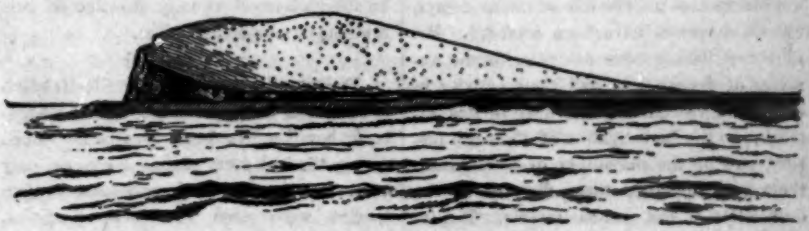
furnished is about four hundred feet. They are all connected by a tunnel, five feet in diameter inside, and walled with brick, which has been constructed in the impervious clay seventy-six feet below the upper limit of artesian flow. From the "wet chamber" of this tunnel, in which the water is collected, it is pumped for distribution over the city. The character of the water is shown by the most careful tests to be of the best.

Science in Iowa.—The paper of most general interest in the Proceedings of the Iowa Academy of Sciences for 1887, 1888, and 1889, is the annual address for 1888 of President Herbert Osborn. It reviews what has been accomplished in Iowa in the various fields of science, and gives a forecast of the directions in which work in the future may be conducted with most immediate advantage. The first Iowa Academy of Sciences, which existed from 1875 to 1884, was the means of encouraging investigation in many parts of the State, and secured the publication of a number of valuable papers. The present Academy, of which R. Ellsworth Call is secretary and treasurer, was organized in 1887. Besides this body, the Iowa Assembly of the Agassiz Association, the State Agricultural and Horticultural Societies, Agricultural College and Weather Service are mediums for scientific publication on subjects appertaining to their respective spheres. Anthropological work has been furthered by the Davenport Academy of Sciences. Much has been done by the geological surveys and by individual naturalists from 1819 on. Continued geological studies and the development of the weather service are indicated as the leading lines on which future scientific work may be prosecuted. The proceedings of the three years covered by the volume contain many excellent special papers.

Uses of Slag.—The slags produced in iron-making vary in composition according to the ore that is used, but are all alike in that their chief constituents are silica, lime, and alumina. From the chemist's point of view they are a kind of impure glass, and they in so far resemble glass that when rapidly cooled they are apt to fly to pieces. The uses to which slag has been longest put are the production of slag-sand by running the molten material into water and the preparation of bricks and mortar from it; and the casting of it into blocks, which are chiefly used in paving. The regular, smooth surface of these blocks is an objection to their use; but this is obviated, and the ideal cleavage surface is obtained by casting them double with a notch around the middle, where they are broken by a sharp blow. Besides being toughened and more dense, the slag, when annealed, has a strong affinity for Portland cement, and unites with it into a concrete of remarkable toughness, which is one of the best pavement materials of its class. The slag, broken by machinery, is largely used in England for road-making; for this purpose, the material should contain about equal proportions of lime and silica and seven or eight per cent of alumina. "Slag-wool," or "silicate cotton," is obtained by turning a jet of steam or an air-jet upon the stream of molten slag as it issues from the furnace. By this the slag is dispersed or broken up into countless small, bead-like particles, each of which, as it flies away, carries behind it a delicate thread of finely drawn or "spun" slag. This substance has several valuable properties. It is extremely light, and absolutely fire-proof; is a non-conductor of heat and sound; and is so porous that it will absorb large quantities of water, and readily retains the same for a considerable time. The last property is important in the use of the substance as a fire-proofing material; for, when water is pumped into a burning building, it is held by the slag-wool as by a vast sponge, and will evolve steam sufficient in itself to extinguish the flames, or at least assist powerfully in doing so. It is also an antiseptic; and this property, in conjunction with its great porosity, seems to render it specially applicable for medical purposes. Slag cements are prepared largely at several factories on the continent of Europe. To make them, the slag-sand, dried, is ground fine, mixed with slaked lime, and stamped, and the whole intimately mixed in a "homogenizer" of special construction. The slag cement is lighter than Portland cement, takes longer to set, and is cheaper. It is held in great favor in Germany, though it is not, perhaps,

so good in all respects as Portland cement. Another kind of slag—the Thomas, or "basic slag," produced in making steel—is remarkable for its richness in phosphoric acid, and is coming into use as a fertilizing material. The demand for it in Germany already exceeds the whole available production of the country, and it is imported from Great Britain and Austria.

The Formation of a New Island.—An interesting account of the newly emerged volcanic island of the Tonga group is given by Mr. J. J. Lister in the Proceedings of the Royal Geographical Society for March. It has received the name of Falcon Island, and was formed by an eruption in 1885. It was visited during its formation by some natives of the group, who say that the center of action was wholly on one side of the present island; showing that in all probability the wind played an important part in determining its position. The uncovered portion lies approximately northwest of the supposed center. It consists of two parts: a conical mound at its southern end, about one hundred and fifty-three feet high, and a flat extending to the northward, which is from ten to twelve feet above high water. There is a considerable shoal area north of the flat, but at the base of the higher portion the water deepens rapidly. The soil of the island consists of a fine-grained, dark-gray material arranged in strata. The strata are marked by difference in color and the varying thickness of the salts which have crystallized on them. The soil below the surface was found still hot; the temperature at a depth of seven feet being 100° Fahr., while at the surface it was only 74°. With the exception of two young cocoanut-trees, which seemed not very hardy, there was no vegetation but a few bunches of grass; and a moth and small sand-piper constituted the animal population. The island will probably have disappeared in a few years, unless another eruption occurs, as the waves are rapidly wearing the shore line away.



FALCON ISLAND.

The Unselfishness of Doctors.—Dr. Robert G. Eccles, in a lecture on the Evolution of Medical Science, delivered before the Brooklyn Ethical Association, pays a just tribute to the unselfishness of the medical profession. Medicine, he says, "in all ages has attracted into its ranks the most self-sacrificing members of society. As a science, it was born in altruism. To this day it offers the greatest opportunities of any department of life for the practice of the most ennobling graces of character. These constitute a primary cause of its evolution. . . . Medical men stand alone in the earth among all others, striving with their whole might to extinguish their own business. They preach temperance, virtue, and cleanliness, knowing well that, when the people come to follow their advice, their occupation, like Othello's, will be gone. They establish Boards of Health, to arrest the spread of disease, while well aware that such sanitary measures steal money from their purses. How well they succeed is shown by official statistics. . . . Nobody ever fails to send for a physician in typhus fever. Only six persons in a million die of this disease. Many more used to die when no effort toward its suppression was made. Whooping-cough seldom frightens patients, and neighborly old ladies of both sexes give advice. As a consequence, 428 in a million die of this disease. Measles, being a little more serious, needs the doctor oftener, and only 341 in a million die. Scarlet fever is still more alarming, so that medical advice is more in demand, and 222 in a million die of it. Diphtheria frightens

still more, thus assuring the doctor's presence oftener, and 168 in a million die. It is thus with every disease: the fewer it kills the more people fear it, because, if they did not fear it, they would play the fool, and give it a chance to kill more people. If bakers, grocers, dry-goods men, carpenters, tailors, and members of all other lines of business, gave as much of their labor in charity as doctors do, poverty would instantly be wiped from the earth."

Dragon-flies and Mosquitoes.—A study of practicable methods of getting rid of the nuisances of flies and mosquitoes has been set on foot by Mr. Robert H. Lamborn, of New York, aided by Mr. Morris K. Jessup; and the first fruits of the effort will shortly appear in the publication of three essays, for which prizes have been awarded. Mr. Lamborn, having been struck with the voracity of dragon-flies, and their activity in destroying mosquitoes and flies, invited attention to the investigation of their life history, and of the possibility of propagating them and applying them directly to the destruction of the noxious insects. The investigations showed that under natural conditions dragon-flies were among the most formidable enemies that the offensive insects had to encounter; but the results as to the practicability of artificial propagation and application were not encouraging. Mrs. Aaron, of Philadelphia, to whom the first prize was awarded, found that, as they do not breed in the same waters as the mosquito, they would have to be produced on an enormous scale and then taken to the mosquitoes; and that the artificial breeding of them is attended with great difficulties. Mr. Archibald C. Weeks, of Brooklyn, made experiments in breeding them artificially, and failed. They can not, moreover, be kept in houses and cities without changing their habits. Mr. William Beutenmuller, of the American Museum of Natural History, finds that dragon-flies are the natural enemy of the mosquito in its various forms and of flies, and that those insects disappear before them, but concedes the difficulty of raising them artificially. These experiments do not dispose of the question of our calling dragon-flies into service. Early efforts usually fail of the success that follows patient persistence. Much may be accomplished at once by encouraging the natural multiplication of the *Libellulidæ;* and future effort may yet develop a practicable way of raising them artificially. Other remedies are suggested which seem efficient and more immediately practicable. Among them are the cultivation of the yeast-fungus, which is fatal to flies, and attacks them frequently; fish-planting; thorough draining of spots where water can stand; and insecticides, one of the most efficient of which is kerosene. One drop of oil applied to a pool having ten square inches of surface cleared it very quickly of all life; and three dollars' worth of crude oil will be sufficient to apply to a mosquito-pond of a hundred acres five times in a season. Spraying petroleum on compost-heaps and other breeding-places is equally effective to prevent the development of flies.

Walking-Sticks and Umbrella-Handles.—The art of making walking-sticks and umbrella-handles has been greatly developed during the last forty years. Formerly, only a very few native woods and some foreign species were used for these purposes. Twenty years ago the first collection illustrating the materials used was presented by a London firm to the museum at Kew. The collection has been completed by a supplementary one from the same house, and in its later form exemplifies many points in the advance of the art. There is now hardly any limit to the material that can be turned to account for the purposes under consideration, and manufacturers keep a keen lookout for new sources of material, and novelties in sticks and fashion. The cultivation of sticks for the market has been taken up as a business at some places in continental Europe, and special attention is often paid to making the roots grow into shapely forms for the handles. A London manufacturing establishment, the floor space of which nearly covers an acre, have extensive storehouses filled with native and foreign sticks, from which stock is drawn, as it is wanted, for the shops. These, as they grow, are often very crooked, and have to be straightened. A heap of sand is provided on the top of a very hot stove, into which the sticks are plunged, and kept till they have become pliable. "The workman then takes

the crooked stick while it is still hot and inserts it in a notch cut in a stout board, placed at an angle inclined from him," where he bends and strains it. When it has become perfectly straight it is thrown down to cool, after which it becomes rigid and permanent in its lines. Heat is an important element in this matter, and produces different effects on the several kinds of wood, the degree of heat necessary to straighten one kind of stick being often sufficient to spoil another kind. The same power which makes a crooked stick straight is applied to make a straight one crooked; so we find that the rigid stems of bamboos, partridge canes, and all the various kinds of sticks that are required to be curled or twisted, are by the application of heat made to assume almost any shape or form. Thus we often see ladies' sun-shade handles twisted and even tied into double knots. By far the largest number of sticks used are those known as natural sticks—that is, saplings of trees or climbing plants, when the roots have sufficient character to form handles or knots. These are always more in demand than sticks cut from solid wood. The finished canes are sometimes mounted with precious metals, stones such as onyx, jasper, marbles, even precious stones, ivory, and horns of all kinds.

Microscopic Structure of Stone.—The investigation of the minute structure of minerals and rocks is recommended by Dr. H. Hensoldt as the application most eminently adapted to afford pleasure and satisfaction to the lover of the microscope. It presents an exceeding complexity of forms and a most wonderful display of colors, and offers a field as yet almost untrodden and affording endless opportunities for research. "Especially striking and lovely is the appearance of many of the volcanic or igneous rocks, when reduced to thin sections, and examined under the microscope. The dullish green lava, called pitch-stone, which is found in dikes on the island of Arran, on the west coast of Scotland, exhibits under the microscope whole forests of fern-trees, garlands, leaves, and flowers of marvelous magnificence. A certain granite from Cornwall contains needle-shaped crystals of tourmaline, radiating star-like from a common center. Basalts, obsidians, porphyries, serpentines from various localities, show labyrinths of multicolored crystals resembling rows of pillars, turreted castles, and fairy caves, glowing in all the tints of the rainbow. The sedimentary or stratified rocks, while they can not under the microscope equal their Plutonic rivals in brilliancy of color or gorgeousness of crystalline display, make up for this deficiency by other features of interest, compensating the inquirer with revelations of a different character, but none the less remarkable. Many marbles and limestones are found to be literally composed of foraminifera, the tests of rhizopods, resembling tiny shells of the most delicate and beautiful forms. . . . Thin sections of almost any piece of flint exhibit under the microscope quite a little world of curious organic remains, such as sponge spicules, xanthidia, small fragments of coral, and the foraminifera already mentioned, furnishing very strong evidence that the flints are silicified fossil sponges. . . . This branch of study, though barely thirty years old, has already contributed such a vast deal of new information to natural science that it has, in more than one respect, revolutionized our old-fashioned conceptions of geological research."

Asphalt in Building Construction.—Some interesting examples of recent new uses of this substance are given in a paper with the above title by Mr. T. H. Boorman, published in Architecture and Building. The writer says: "From the cellar to the roof, asphalt has been used where the requirements have been water and fire proof floors. Its principal merits are its *utter imperviousness to water or damp*, and its *elasticity*, whereby cracking, especially from the influence of frost, is prevented. Also from a *sanitary* point of view the advantages of asphalt are incontestable, for it possesses great antiseptic properties, and, owing to its having no joints, it is impossible for particles of animal or vegetable matter to lodge in crevices and putrefy. It greatly promotes cleanliness, as it can be easily washed, and for this reason is invaluable in hospitals, breweries, stables, etc. Asphalt first appears in your specifications as under the item of 'damp course.' It is advisable to lay throughout the walls on the grade of the cellar-floor half an inch

of asphalt, with a lap of about two inches on the inside, so allowing a connection with the asphalt finish of the cellar-floor and hermetically sealing the house from damp, noxious gases, and vermin. In residences you will probably consider you have done your duty by asphalt if you have thus specified for your damp course and cellar-floor; in the latter, by the way, three fourths of an inch of asphalt on three inches of hydraulic cement concrete will serve the desired purpose of a durable damp-proof floor. The yards of city residences are now frequently laid with asphalt, the material being peculiarly adapted to the roller-skates and tricycles of the younger members of a family. From a building, then, in which only one floor, the cellar, is required to be of asphalt, let us consider where every floor and the roof can be of this material; in printing-houses, lithographing establishments, breweries, sugar-refineries, and slaughter-houses, you will often find this material used throughout. This year, however, sees a novelty in construction with asphalt. Theophilus P. Chandler, Jr., architect, of Philadelphia, is using rock asphalt on every floor of a large apartment-house; the carpets will lie on the asphalt, being fastened down to narrow strips of wood set against the partitions when the asphalt is laid. Now, I fancy I hear you say, 'Well, asphalt is not pleasant in appearance.' Why, gentlemen, the mayor's private office in the great City Buildings of Philadelphia, the greatest municipal edifice in the country, is laid with asphalt with a border of colored tiles."

Some People of New Guinea.—Of the natives of the neighborhood of the Owen Stanley Range, New Guinea, Sir William MacGregor says that their features are decidedly good, and their faces indicate more character and strength than those of the average coast men. The cheek-bones in some are rather broad and prominent. The nose is generally of the Semitic type. They possess all the volubility of the Papuan race, and are less shy than tribes that have seen more of white men, but are apparently superstitious and easily frightened. "They informed us that they used both the bow and the spear, but we never saw one of them with a weapon, and I could not induce them to bring any to camp; not, as it appeared, as if they mistrusted us, but seemingly doubting whether it would not be misunderstood should any of them with arms in their hands meet any of our party away from camp." They always left the camp before nightfall. They would exchange food for salt, beads, and cutlery, but did not care much for tobacco, growing a good quality of their own. They also cultivate peas, beans, yams, sweet potatoes, and several varieties of bananas, and have abundant food.

Origin of the American Indian.—Prof. F. W. Putnam, in an address before the Archæological Association of the University of Pennsylvania, said, in reference to the origin of our Indians, that two well-defined groups of races are found in America. They have entirely different-shaped skulls. One group starts in Mexico and reaches to Peru. They are a short-headed people. They extended across from Mexico along the Gulf coast, up the Mississippi Valley and along the southern portion of the Atlantic coast, not crossing the Alleghanies and not being found north of the Great Lakes. They were the people that built the mounds and founded the civilization of Mexico and Peru. Another race, a long-headed people, inhabited the northern part of the country, and were the authors, among other articles, of certain objects found in Wisconsin. These two races have met and mingled, and the result is the American Indian.

Results of M. Pasteur's Anti-rabic Treatment.—M. L. Perdrix's report of the anti-rabic vaccinations at the Pasteur Institute since 1886 divides the cases treated into three classes: those of persons bitten by dogs ascertained experimentally to be mad; of persons bitten by dogs decided by veterinary examination to be mad; and of persons bitten by dogs supposed to be rabid. The proportion of deaths after treatment is shown by the tables to be very small; for a total of 7,893 cases of all the classes, it was 0·67 per cent; but the proportion has decreased from year to year; it having been 0·94 per cent in 1886, 0·73 in 1887, 0·55 in 1888, and 0·33 in 1889. The decrease is attributed to a better appreciation of the grav-

ity of the cases and a more judicious proportioning of the measure of treatment to that feature. The gravity of the case appears to vary somewhat according to the part of the body that is bitten. The most dangerous bites were in the head, with which the mortality was 2·36 per cent; next were the hands, 0·69 per cent; and last the body and limbs, 0·27 per cent. The inferior gravity of the last class of bites may, perhaps, be attributed to the action of the clothing in wiping the animal's teeth.

The Unexplored Regions of Canada.—It is commonly supposed that all parts of Canada have been explored and are known. Mr. G. M. Dawson thinks that this opinion is not correct, and that the clearness of the maps, on which it is chiefly founded, is due to their makers having assumed for regions of considerable extent what has not been verified. Probably but little of the regions which are really unknown is agriculturally or climatically attractive; but they may contain mineral wealth, and some of them may in time have value for cultivation. In marking out the districts which he regards as unexplored, the author takes no notice of comparatively small tracts of country lying between explored regions, or of any having an area of less than 7,500 square miles; and he also omits the arctic islands lying to the north of the continent. With these limitations he enumerates and defines sixteen distinct regions in the Dominion concerning which definite and satisfactory information is wanting, varying in area from 7,500 square miles to 289,000 square miles. In all, it may be stated that "while the entire area of the Dominion is computed at 3,470,257 square miles, about 954,000 square miles of the continent alone, exclusive of the inhospitable detached arctic portions, is for all practical purposes entirely unknown. In this estimate the area of the unexplored country is reduced to a minimum by the mode of definition employed. Probably we should be much nearer the mark in assuming it as about one million square miles, or between one third and one fourth of the whole. Till this great aggregate of unknown territory shall have been subjected to examination, or at least till it has been broken up and traversed in many directions by exploratory and survey lines, we must all feel that it stands as a reproach to our want of enterprise and of a justifiable curiosity. In order, however, to properly ascertain and make known the natural resources of the great tracts lying beyond the borders of civilization, such explorations and surveys as are undertaken must be of a truly scientific character."

Crystallization seen in the Act.—The process of crystallization as observed under the microscope is described by Dr. H. Hensoldt in a paper on crystallogenesis. The commencement of the operation is always signaled by the sudden appearance, in the previously clear and colorless field, of innumerable dark points, which, in an incredibly short time, augment in volume, till a diameter of perhaps $\frac{1}{100}$ of a millimetre is reached. It is then observed that the particles are spherical in outline, and that their darkness is only an optical illusion, caused by a broad diffraction-ring, for in reality they are quite transparent. They are evenly distributed over the field, and their "growth"—a kind of spontaneous swelling, which can be plainly followed—is uniform and simultaneous. The particles then appear to become suddenly endowed with polarity; they change their positions, roll about like billiard-balls in every direction, yet always in straight lines. For a moment all seems confusion, but behold! some invisible "floor-master" is asserting his authority, and in another instant we have the first manifestation of a symmetry destined to culminate in that perfect crystalline regularity which has excited the wonder of all ages. The globules, originally scattered all over the field, are now arranged in lines or rows, like so many strings of beads. Some of these rows consist of only three or four globules, in others we can count ten, fifteen, twenty, or more; and it would seem as if each spherical body was surrounded by a delicate film or pellicle, which prevents the dissipation of the internal molecular forces. A series of rapid changes is now inaugurated, which can be followed only with the greatest difficulty. The globules in each line, by a sudden and simultaneous movement, unite and form solid rods, and there are grounds for believing that this solidification is due to the ruptur-

ing of the mysterious pellicle referred to. Within a quarter of a second after the formation of the rods (which are of uniform thickness, however much they may vary in length), we observe a general commotion among them. Each now appears to act as a separate bar-magnet, and while some unite at right angles, others range themselves in close contact side by side, and form a symmetrical wall. Layer is piled on layer; each little rod falls mechanically into its proper place; and before we have time to realize the strangeness of the spectacle, the field is studded with little cubes of exquisite brilliancy. What we have seen here in an evaporating drop of chloride of sodium may be observed in any other saline substance which we allow to crystallize under the microscope, with the sole difference that the diameter of the globules and the form of the ultimate crystals vary according to the nature of the substances employed.

The Genuineness of the "Nampa Image."—The Boston Society of Natural History had a discussion a few months ago respecting the "Nampa image," or the little human figure of clay that was found in boring a well at Nampa, Idaho, in August, 1889. Prof. Wright produced letters and statements substantiating the genuineness of the discovery and certifying to the eye-witnesses of the fact as men of unimpeachable intelligence and integrity. A report by Mr. Albert Allen Wright, on his examination of the image as to the material of which it is made and its appearance, stated conclusions favorable to its antiquity. Prof. G. F. Wright regarded the direct evidence as of as high order as could well be obtained. "There was no sensational publication in the papers, nor has there been any suggestion of mercenary motives. There were no archæologists or scientific men on the ground to be humbugged. Apparently the image would have disappeared and dropped out of notice but for the fortunate chance which brought it to the attention of Mr. Adams, when his own mind was interested in that class of subjects. The evidence is most direct as to the impossibility of the image's having fallen into the well from the surface, or of its having been put in by design." Much weight is also attached to Prof. F. F. Jewett's opinion as to the character of the iron oxide on the image. "It seems in the highest degree improbable," Prof. Wright adds, "that any one should have manufactured such an object on the spot, and been so successful in meeting all the conditions present. I am, therefore, prepared to accept without further question the genuineness of the image, and shall look for further confirmation as time elapses." Prof. Putnam spoke of natural evidences which the image afforded of its age. Prof. H. W. Haynes said that he regarded the image as a most important evidence of the antiquity of man in America.

NOTES.

Prof. J. W. Spencer has extended the observations of Mr. G. K. Gilbert on the old beach surrounding Lake Ontario at a distance of several miles from the shore of the present lake. He has traced it along the Canadian side, and at the eastern end, where Mr. Gilbert had not been. For the ancient body of water that occupied the basin bounded by this beach, he proposes the name Lake Iroquois. The gravel ridges forming the several portions of this beach were used by the Indians for their trails, as they afforded dry pathways through a country elsewhere often muddy. The fact that some parts of this beach are higher than others is explained by the warping of the crust since the beach was formed.

It is contended by Mr. Alexander Bowbronicki that an unhealthy town has no other meaning than a proportionate accumulation of decaying or putrescible matter. Thus, in Manchester, England, the causes of mischief are overcrowded streets, badly kept; surface impurities in streets, yards, and corners; and sewers of such construction as admits of their structure becoming sodden and of their charging the surrounding subsoil with filth, whereby the atmosphere is contaminated by the escape of the foul air through the ventilating holes. The author believes that sewers are to protect the subsoil against contamination from the surface and to maintain as steadily as possible the level of the subsoil water, rather than to remove superficial and closet foulness; and that that should be disposed of by the pail system.

A complete account of Prjevalski's zoölogical observations and discoveries during his expeditions to central Asia is in course of publication in Russian and German text, at the expense of the Imperial Crown Prince Nicholas of Russia.

Dr. J. Walter Fewkes has described in The American Naturalist some specimens of excavations made in rocks by sea-urchins, which he observed at Grand Manan, New Brunswick. Other places where such excavations have been found are Florida, the West Indies, Panama, California, the Mediterranean, coasts of the British Isles and France, and Australia. The holes, which are occupied by the animals, are never deeper than the thickness of the urchins' bodies, and are very smooth. It has been suggested that the holes are worn by the spines of the animal, or perhaps chiseled out by its teeth, and Dr. Fewkes adds that perhaps motions of the animals caused by waves aid the process of erosion. Another recent paper by Dr. Fewkes describes some Californian *Medusæ*, with plates.

A writer in the North China Herald of Shanghai asserts that the climate of Asia is growing colder, and its tropical animals are slowly retreating southward. In proof of this he quotes evidences, historical and referential, of the former existence of elephants, tigers, and leopards in China. Tigers and leopards are, however, not yet extinct in China, and are common enough in Corea. The bamboo, it is said, formerly grew naturally in parts of the country where it now has to be taken care of.

The Central Park Menagerie had 907 animals on exhibition during 1889, representing 242 species, 164 genera, and 71 families. The most notable additions to the collection were, by gift or exchange, a three-toed sloth, an American civet-cat, very seldom seen alive in zoölogical collections, and a pair of young elks; and by birth a sea-lion, two nylghaie antelopes, and one hippopotamus. The last died four days after birth. The principal cause of death among the animals was congestion of the lungs.

"To get rid of the timber," the answer given to an inquiry from the Michigan State Forestry Commission respecting the timber policy of the State of Arkansas, is made by Mr. William Little the text of a letter to the Montreal Board of Trade on the importance of preserving the timber. The interests of the United States and Canada in this matter are substantially the same. Having shown that the forests of the continent are on the verge of extinction, and having pointed out the lesson that the people of the United States will shortly be taught, if our political bosses impose a restrictive duty on Canadian lumber, the author warns his countrymen that if they continue stocking our saw-mills with logs taken from this already too scanty supply, and keep warring on their forests, they will soon be able to "get rid of their timber," and to get rid at the same time of the most valuable property they ever had or may ever expect to have in their country.

A group of papers from the Journal of Mycology on The Treatment of Plant Disease is published in a separate pamphlet by the Section of Vegetable Pathology of the United States Department of Agriculture. The relation of Mr. A. A. Crozier's experiments on the effects of certain fungicides upon the vitality of seeds shows that soaking in blue vitriol and in copperas tends to retard germination. Prof. Byron D. Halsted contributes an investigation of the scald and gall fungus of the cranberry. Other papers, by different authors, relate chiefly to other fungoid diseases and to the qualities of fungicides.

Six scholarships have been established in the Missouri Botanic Garden to provide six years' courses of theoretical and practical instruction for young men desirous of becoming gardeners.

Although there is a wide enough field for platinum-plating in the making of various kinds of instruments and apparatus, such great difficulties attend the process that it has never been made a commercial success. In the first place, the metal tends to separate from its salts in the spongy form instead of forming a firm, hard coating. Then, too, platinum is so insoluble that plates of it can not be used for keeping up the strength of the bath. Mr. William H. Wahl has communicated to the Franklin Institute a method of depositing platinum by which these difficulties are largely avoided. For keeping up the strength of the bath he uses platinum hydrate, which dissolves freely in aqueous solutions of the alkaline hydrates, forming platinates. These platinate solutions conduct electricity freely and yield bright, reguline, and adherent deposits of the metal.

On the French coast of Croisic may be seen thousands of little sea-urchins ensconced in cavities in the granite rock, the openings of which are too small to permit their ingress or exit. The animals, it is not doubted, make and widen the holes for themselves, but the question how has not been answered. Chemical solution of the rock does not seem possible, as no sufficiently strong acid is found in the animal. M. John has recently explained it by mechanical action. With the so-called lantern of Aristotle, a curious formation with which the animal breaks up the hard substances on which it feeds, it probably bites the rock; the sucker-feet are attached, and a rotary motion is imparted to the body, the spines and the lantern slowly wearing down the surface of the rock.

A report of the first systematic attempt to determine whether beets can be raised successfully for sugar in Nebraska is given in Bulletin No. 13 of the State Agricultural Experiment Station. Beets had been raised

on the Industrial College farm that yielded over fifteen per cent of sugar, when, in the spring of 1888, the people around Grand Island undertook to demonstrate that beets could be raised there rich enough in sugar to warrant investment in a sugar plant. The result was satisfactory, and the experiment was extended through the whole State for the season of 1889. The results are detailed in the Bulletin.

THE natural result has followed the offer by the Government of India of rewards for the heads of snakes. The Chief Commissioner of the Central Provinces reports that the natives there are beginning to breed and raise poisonous snakes for the sake of getting the head-money offered.

A MONUMENT to M. J. C. Houzeau was to be unveiled at Mons on the 2d of June.

OBITUARY NOTES.

SIR EDWIN CHADWICK, whom an English paper styles the "father of modern sanitary science," died in London, July 5th, ninety years old. He was born in 1800, near Rochdale, of an old family, famous for the long lives attained by some of its members. He was admitted as a barrister in 1830, and also engaged in literary work; and, from the appearance of an article on Life Assurance in the Westminster Review, his life is most largely a record of efforts to improve the conditions of health. Among the direct or indirect fruits of his activity were the establishment of industrial schools for destitute children; provisions for the care of aged poor and infirm; reforms in workhouse systems; the ten-hour law; the half-time system for children; the first sanitary commission; and the establishment of the Registrar-General's office. He was a permanent Commissioner on the Local Government Board; did good service in Crimean and Indian questions; and was President at different times of Sanitary Congresses, of the Society of Sanitary Inspectors, and of the Economical Section at meetings of the British Association. On the 2d of March, 1889, his ninetieth birthday, he was given a dinner by the Association of Sanitary Inspectors. A little before this time he was made a Knight of the Bath.

GENERAL JOHN CHARLES FRÉMONT died in New York, July 13th, in his seventy-eighth year. The political and military incidents of his later life have somewhat obscured the recollection of what he did for the advancement of knowledge in the earlier period of his career. The region of the Rocky Mountains was then practically unknown. He undertook in 1842 to explore it and open an overland route to the Pacific. In 1843 he led an expedition up the valley of the Platte, explored the Great Salt Lake, etc., to Fort Vancouver, near the mouth of the Columbia River. On the return journey he came back through the Great Basin and the South Pass. In 1845 he conducted an expedition to explore the Sierra Nevada, in California, in connection with which he became engaged in military and political complications. In 1853 he led a party at his own expense to the Pacific, by a new route, near latitude 38° north. Full accounts of his discoveries were published in his reports to the Government and in other books; and though the regions he visited are familiar enough now, the works had then all the freshness of novelty. For his services as an explorer he received gold medals from the King of Prussia and the Royal Geographical Society.

SIR WARINGTON SMYTH, Professor of Mining at the Royal School of Mines, Jermyn Street, London, died June 19th, in the seventy-third year of his age. He was born in Naples; spent his early boyhood in Italy; was sent to the English schools and was graduated from Cambridge; took a prominent position as a scientific authority on mining; was appointed in 1851, on the nomination of Sir Henry De la Beche, lecturer on mineralogy and mining; was made mineral surveyor to the Duchy of Cornwall and inspector of crown mines; and was invariably consulted by the Government on mining matters. His contributions to geological journals, reports, etc., were numerous, but have not been collected. He was the author of a Rudimentary Treatise on Coal and Coal-Mining, and of a Book of Travels.

MR. W. KITCHEN, for fifteen years Hunterian Professor of Comparative Anatomy in the Royal College of Surgeons, and President of the Royal Microscopical Society in 1871 and 1872, died early in July. He was distinguished by his investigations on the minute foraminifera and the morphology of the vertebrate skull.

PATRICK BARRY, one of the most distinguished American horticulturists, died at his home in Rochester, N. Y., in June. He was born in Belfast, Ireland, in 1816, and came to America when twenty years old. He was especially interested and efficient in pomology, and his Fruit Garden has long been one of the most valuable standard works on that subject. He was for more than thirty years President of the Western New York Horticultural Society, and was a member of the Board of Control of the State Agricultural Experiment Station. He was for several years editor of The Horticulturist, when it was the leading periodical in that branch, and afterward horticultural editor of the Genesee Farmer. "As an author and editor," says Garden and Forest, "he always had some instructive message, and he always delivered it in a way that compelled attention"; and "it might be said that his influence has reached every orchard and garden of the country."